1972

Nuclear deterrence and the anti-ballistic missile

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NUCLEAR DETERRENCE AND THE ANTI-BALLISTIC MISSILE

By

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B.A., Harvard University, 1970

Presented in partial fulfillment of the requirements for the degree of

Master of Arts

UNIVERSITY OF MONTANA

1972

Approved by:

Chairman, Board of Examiners

Dean, Graduate School

Aug 21, 1972

Date

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ACKNOWLEDGEMENTS

This thesis has been, as any thesis must be, the result of the suggestions and advice of many people. I want to give thanks to the comments of Dr. Thomas Mongar and Mr. Sidney Herzig who were initially members of my thesis committee. I am especially grateful to Dr. Louis Hayes for assuming the chairmanship of my committee after Dr. Mongar left the University, and for the assistance which he gave me. I am also particularly appreciative of the aid given to me by the other two members of my committee, Dr. Paul Miller and Dr. Leo Lott. The advice and criticism of these two professors was valuable indeed.

Most of all, however, I wish to acknowledge the aid of my beloved Natalie, without whose understanding and inspiration I am sure this thesis would never have been finished.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The last thirty years have witnessed a rapidity and variety of technological changes undreamed of a mere half century before. Rockets carry astronauts hundreds of thousands of miles to the moon and back again. Satellites are now able to aid in the long range prediction of weather, while other satellites relay television and telephone signals from one continent to another. Computers are becoming more and more important to the operation of our society. Mathematical problems involving thousands of operations can now be done in a second. The storage and retrieval of information allowed by computers has made it a simple matter for world wide businesses to know the exact size of their inventory of a particular good throughout the world at any given time. These same capabilities have allowed governments to amass files of private information on large numbers of individuals in the population of each country. And so the list can go on and on. The technological revolution of the past third of a century has been truly remarkable, but, of course, it has not been an unmixed blessing.

Technological innovation continues at an ever increasing rate of speed. Indeed, many are now wondering if the social, political and biological systems which govern man's existence can adapt to the new environment created by these developments.

Nowhere have the effects of innovation been more dramatic than

in the technology of the weapons of war. And in no other area is the problem of adaptation to change more crucial to the survival of man. The Second World War was the impetus for two revolutionary developments to which the great powers have still not fully adapted: nuclear weapons and the guided missile.

From the beginning of time man has been fighting wars with the best weapons which his society could develop for him. To be sure, there have been dramatic changes in the past in the art of warfare. The use of metal to make swords and spears, and the discovery of gunpowder to be used in guns and cannons are just two of many innovations which undoubtedly seemed revolutionary at the time. However, through all of the developments prior to nuclear weapons there was a continuity in military thinking. The great campaigns of the Romans and Greeks still had relevance to the art of warfare in the pre-nuclear Twentieth Century, and the brilliant Eighteenth Century military strategist von Clausewitz was still important to the generals of World War II.

Nuclear weapons created a discontinuity in the significance of the entire two and one half thousand year history of military thought with respect to the future. A war which might be started and completed within a matter of minutes, without a single face to face encounter between the soldiers of the opposing powers is obviously very different from any kind of warfare which had preceded it. Numbers of soldiers and weapons no longer had the importance which they had in the pre-nuclear age. A standing army of ten million men could not equal the destructive power of a single nuclear device. And, on the other hand, the fact that one power had three or four times the nuclear

capability of another is no indication that the first could "win" a nuclear conflict with the second in any kind of meaningful way.

The thinking of the past is clearly inappropriate to the nuclear conditions of the present. But old, deeply ingrained ideas are slow to fade away. While the dangers of using the old principles today makes it imperative that the big powers adapt to the new situation, the change in thinking has not been completed. The conventional wisdoms of the past are still more comfortable than the new logic required to deal with nuclear weapons. The danger is that very often the principle of conventional warfare requires a different conclusion with regard to a nuclear issue than would the new logic. The destructive power of nuclear weapons demands that the nuclear powers do not make such errors. The avoidance of nuclear war may depend primarily upon the ability of the world leaders to adapt their thinking to the realities of the nuclear world and refrain from applying conventional strategy to problems dealing with nuclear power.

The issue of the deployment of an anti-ballistic missile is an excellent example of a nuclear problem which cannot be satisfactorily interpreted through pre-nuclear rules of strategy. An anti-ballistic missile is a weapons system designed to intercept incoming nuclear warheads and destroy them before they can damage the target state. In the pre-nuclear period, if a state built a wall or other type of elaborate defensive system designed to keep an enemy out, the purpose of the system would be apparent: it would be solely for defense. It could serve no function as an offensive weapon. But a defensive wall built behind an anti-ballistic missile system is not so unequi-

vocally clear in purpose. For reasons which will be explained later, an anti-ballistic missile system, in certain forms, may be of as much or more value to an aggressor state as it is to a non-aggressor. Conventional strategy would suggest deployment of an ABM where there existed a real danger of attack. While the danger of attack may still exist for the United States, or, for that matter for the Soviet Union, the conclusion to deploy an ABM system cannot be reached so quickly.

This research effort attempts to examine the reasons upon which a decision to deploy an anti-ballistic missile system must be based in the nuclear age. The subject is complicated by a number of factors. The first, as noted above, is the emotional attachment of many learned people to strategies inappropriate to the world today. A second complication is the fact that very often all ABM systems are treated as one, eliciting either total approval or total disapproval for any form of an ABM system. In fact there are two very distinct types of anti-ballistic missile systems and the consequences of the deployment of one of these systems as opposed to another are very different.

Specifically, this thesis will endeavor to answer the following question: Will an ABM, in any form, be likely to increase the security of the United States from nuclear attack if it deploys it? This is far from being a moot question. The United States has decided upon an ABM of one specific type, but there is no assurance that the issue to expand that deployment will not arise again. On the other hand, if the strategic arms limitation talks prove to be fruitful between the United States and the Soviet Union, the decision to deploy an ABM may be reversed regardless of the arguments noted in this work. In the

absence of some agreement on the limitation of strategic arms, the question of the anti-ballistic missile is one which will remain with us for a long period. In an effort to clarify the issues in the mind of the researcher, this effort was undertaken.

Research Approach

Deterrence is present in all forms of influence in human affairs.[1] This is true whether the units of interaction are individuals or complex socio-political organizations. It is true whether the interacting units are in competitive interaction, cooperative interaction or some combination of the two.[2]

Deterrence is not usually given such broad applicability to the interaction of social or political units. In general the literature has concentrated upon the techniques of fear which can be utilized to bring about deterrence of an undesired event. A commonplace example of the conventional view of deterrence is the following: A child is warned by this father that if he misbehaves at the dinner table, he

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[1] Ithiel De Sola Poole, "Deterrence as an Influence Process," in Pruitt and Snyder (eds.), Theory and Research on the Causes of War (Englewood Cliffs, N.J.: Prentice Hall, Inc. 1969), p. 189.

[2] Kenneth J. Holsti, International Politics: A Framework for Analysis (Englewood Cliffs, N.J.: Prentice Hall, Inc. 1967), pp. 146-149. Holsti suggests that competition takes place where two interacting states are both competing for the same scarce value. Cooperation takes place where two or more interacting states: 1. Either are not pursuing the same values and can attain more of the values which they are seeking through cooperation, or; 2. Are in pursuit of the same value, but all the interacting units can realize more of that value through cooperation. N.B. I have substituted here the terms competition and cooperation for the terms which Holsti uses, conflict and collaboration, for purposes of clarity.

will be spanked. The child believes the threat and behaves. In the absence of the threat the child would have misbehaved. A broader view of deterrence which is accepted in this paper would include not only the preceding example but also the following: A child is told by his father that if he behaves at the dinner table he will be allowed to go to the circus. The child had wanted to go to the circus, he believed his father and as a result behaved. In the absence of the inducement, he would have misbehaved.

The apparent difference between the two examples disappears when one recognizes that for every inducement offered, there is an implied threat, and that for every threat which is made, there is an implied inducement. Thus, when the child was threatened with a spanking, the implied inducement was that for being good, the child would not be spanked. Where the child was offered the inducement of going to the circus, the implied threat was that misbehavior would result in not going to the circus. Both situations attempt to influence the child's apprehensions as to his future state of well being. The only difference between the two is the customary manner in which they are distinguished in common everyday usage. For purposes of analysis, they can be treated the same.

Snyder has suggested these conditions, from which deterrence may follow:

> "1. Any form of control which one unit of interaction has over the present or future value inventory of another;
> 2. From the communication of a credible threat or promise to

increase or decrease that inventory and; 3. From the second unit's degree of confidence that the threat will be fulfilled."[3]

Deterrence takes place when, as a result of threat or inducement, the action which the deterring unit did not wish to take place, in fact does not.

At any given time, the decision makers will have a number of alternative actions which they may make with respect to a particular policy question. Where the decision makers are attempting to operate in the best interests of the unit which they serve, they will choose the alternative which they note will be the most beneficial to the unit as a whole.[4] This particular alternative is that alternative which has the highest utility for that unit, in the eyes of the particular decision maker. A possible deterrence situation might arise where this alternative, labeled X, effects the utility of another unit. If the decisions makers of the second unit apprehend that

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[3]Glenn H. Snyder, Deterrence and Defense: Toward a Theory of National Security (Princeton, N.J.: Princeton University Press, 1961) p. 19.

[4]Utility, or level of utility, refers to an abstract level of well being of the unit. It is not a reference to usefulness. Throughout this work, it will be assumed that this abstract level of well being will be defined by the decision makers of the unit involved. It will also be assumed that the decision makers act in an attempt to maximize their conception of the collective state of well being and not any private set of utilities.

It is noted, and accepted that as a general rule it is not useful to describe international dealings in terms of "national interest," which is synonymous to the "collective state of well being" above. There are far too many policy makers, each of whom has a different conception of the "national interest" for such a term to be of much predictive value. However, in the case of nuclear deterrence this problem is mitigated to some extent by the fact that the national interest of the state can fairly universally be described as the absence of nuclear war. Upon this question, there is little disagreement at all levels of decision making.

alternative X would not have as high a utility to the second unit as another alternative, the decision makers of the second might attempt to deter alternative X and in the process induce the choice of the other alternative. Unit A will be able to deter action X by unit B under the following conditions:

1. Where unit A communicates to unit B that if action X is taken that unit B will be punished;
2. Where the decision makers of unit B believe that unit A has the capability of carrying out the threat;
3. Where the decision makers of unit B believe that unit A will carry out the threat;
4. Where the punishment lowers the utility of action X to below the utility perceived by the decision makers of B in the other alternative actions, or;
5. Where unit A communicates to unit B that if action Y is taken, instead of action X, that B will somehow be rewarded;
6. Where the decision makers of B believe that A has the capability to carry out its promised reward;
7. Where the decision makers of B trust that the promise will be carried out and;
8. Where as a result of the promised reward, the utility of action X is no longer perceived to be the greatest of all the alternatives.

Deterrence will exist with regard to the undesired action if either conditions one through four or conditions five through eight exist

between the two interacting units. Whether an action is deterred as a result of promised rewards or threatened punishment is relevant only to those who must choose among the various techniques and instruments of influence.

The deployment of an ABM system in the United States will affect the ability of the United States to deter nuclear war with the Soviet Union to the extent that it influences: 1. The perception of the Soviet decision makers of the American capability to damage the Soviet Union with a retaliatory strike and; 2. The belief of the Soviets that the United States would retaliate. In general, the ABM will increase the ability of the United States to deter nuclear war to the extent that the decision makers of the USSR perceive the inadvisability of starting nuclear war because of it. If an ABM increases the value of initiating a nuclear war on the part of the Soviet decision makers, it will correspondingly decrease the effectiveness of the ABM as a deterrent shield for the United States.

In order to investigate this problem, a general model of nuclear deterrence has been synthesized. The principles of deterrence derived from that model will be applied to the ABM in the last chapter in order to reach some conclusion about value to the security of the United States.

Method Used in Study

The model of nuclear deterrence is developed in two chapters. Chapter two serves as a theoretical introduction to the subject. In that introductory chapter, a technique of analysis is borrowed from

economics for use in the discussion. This technique is that of utility analysis by means of indifference curves and utility maps. While the researcher is not aware of this particular application ever being made previously, it is his opinion that the method has much to commend itself. In the first place, the problem of deterrence is, as Snyder was quoted earlier as stating, one of exerting control over the present or future value inventory of another unit. Deterrence, then is an economic problem, in its broadest sense. One aspect of the study of economics, microeconomics, deals with the study of how people attempt to maximize their own utility from given quantity of scarce resources. The analysis of chapter two attempts to describe the actions of states in the process of maximizing utility or national interests.

Secondly, while the work of chapter two does use economic constructs, the principles are directly from political science. The analysis is based upon the fact that interstate relations may be characterized by two variables: the degree of interaction and the degree of competition or cooperation which the interaction reflects.

Lastly, it may be noted that in general the application of economic principles and constructs to political science has been particularly fruitful in the area of international relations. The widely admired works by Thomas Schelling and Kenneth Boulding are prime examples of this fact.

Chapter two is a theoretical chapter upon which chapter three builds. The third chapter does not deal with abstracts but with the real world problems of nuclear deterrence. It identifies the problems and provides what the researcher believes is a necessary background

to the understanding of the anti ballistic missile problem.

Chapter four deals exclusively with the issue of the ABM. The discussion focuses upon a comparison between the two very different types of systems which might be developed and deployed. One type of system is that which would provide protection for a major portion of the population and industrial strength of the United States. The other type of system would provide protection only for the inter-continental missiles which must be able to survive a surprise attack if they are going to serve as an effective deterrent to attack.

No attempt has been made to deal with two technical questions directly related to the anti-ballistic missile. It was not felt that the researcher was competent to pass judgment on these questions. Left unanswered is the question of whether an ABM can be developed. which would be able to carry out the task for which it was designed. There are many widely respected scientists who hold completely opposing views on this question. Herbert F. York and Jerome Weisner suggest that no ABM system can be built which will function at all under attack conditions.[5] Others such as Hans Bethe, contend that an ABM can be developed which would provide very adequate defense of hardened missile and command installations, but that the effective

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[5]Herbert F. York, "The Arms Race and the Fallacy of the Last Move" Bulletin of the Atomic Scientists, June 1969, pp. 27-28. Jerome Weisner, "The Case Against an Anti-Ballistic Missile" Look, Nov. 18, 1967, pp. 25-27.

protection of population and industrial centers is impossible.[6] The other end of the spectrum of opinion is represented by Edward Teller who is convinced that it is well within the technological capability of the United States to build a system which would effectively protect cities as well as hardened installations.[7]

While the scientific community is in wide disagreement on the previous question, there is a consensus on the proposition that the technical difficulties associated with the defense of hardened missile facilities could be far more easily solved than those associated with the defense of cities.

A second technical question which has not been analyzed is the following: Assuming that an ABM system could be developed which would provide either defense of the cities or which could only provide defense for hardened installations, would the marginal measure of security which would be derived from the system be greater than the marginal measure of security which would result from an equal expenditure on other means of defense? With respect to the defense of the cities the question becomes: Would more lives be saved in the event of a nuclear attack

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[6]Hans Bethe, "Hard Point v City Defense" Bulletin of the Atomic Scientists, June 1969, pp. 25-26. "Hardened installations" refer to those facilities which have been protected against direct nuclear blasts by reenforced concrete or by placement far underground or beneath bedrock. No site can be fully protected against a direct nuclear blast, but the hardening does provide quite effective protection against fairly close strikes. How close the strike need be to overcome the protection depends upon the size of the nuclear device and the amount of concrete and rock used to protect the target. Those targets which have not been so protected are referred to as "soft."

[7]Edward Teller, U.S. News and World Report, May 26, 1969, pp. 87-90.

if $X billion were spent on bomb shelters or the same amount on an ABM system?

With respect to the defense of missiles the question is: Can the strategic missile force be better protected through a given expenditure on an ABM or through the same expenditure on other defensive means such as hardening? It is impossible to address these questions without knowing what an ABM system might cost and what its effectiveness might be. These cost and effectiveness figures are directly related to the first technical question noted above, and cannot be answered without first having an answer to that prior question.

The ultimate effectiveness of any anti-ballistic missile system which the United States might deploy will depend upon whether the Soviet Union responds to it, and if there is a Soviet response, the nature of their reaction. In discussing the two types of systems which the United States might deploy, the inducement to react which each system provides is taken into consideration.

This research project does not deal with any other problems associated with the development and deployment of an anti-ballistic missile system except those which pertain directly to the relationship between the United States and the Soviet Union. The author recognizes the importance of the issues which relate to the various alliance structures and commitments to third parties, but they are of limited and indirect importance to the deterrence of nuclear war. On the issue of nuclear war, we still live in a world where the actions of the two super powers are of principal and dominant importance.

CHAPTER II

A THEORETICAL INTRODUCTION TO DETERRENCE

Any discussion of deterrence must ultimately rest upon a discussion of the values which the decision makers of a political unit predict will result from their actions. At any level of the nation-state, these values are the "national interest" as it is perceived and defined by the leaders of a state.

The national interest is an economic concept in the sense that it refers to a state of well-being, or, in economic terms, utility. This chapter attempts to illustrate a number of concepts which are pertinent to the discussion of deterrence through the use of economic utility models. The analogy is made between the utility maximizing individual and the nation-state, the leaders of which attempt to maximize "national-interest."

Because these models are not widely used in Political Science, an explanation in strictly economic terms is made. Following these explanatory notes, the models are applied to inter-state interactions.

Figure 2:1 illustrates the "utility map" of an individual with respect to two commodities, food and clothing. The amount of clothing which the individual purchases is measured on the Y axis. The amount of food which he purchases is measured on the X axis. This particular graph represents the problem which confronts the individual, O, when he has decided the total amount of money which he wishes to spend on

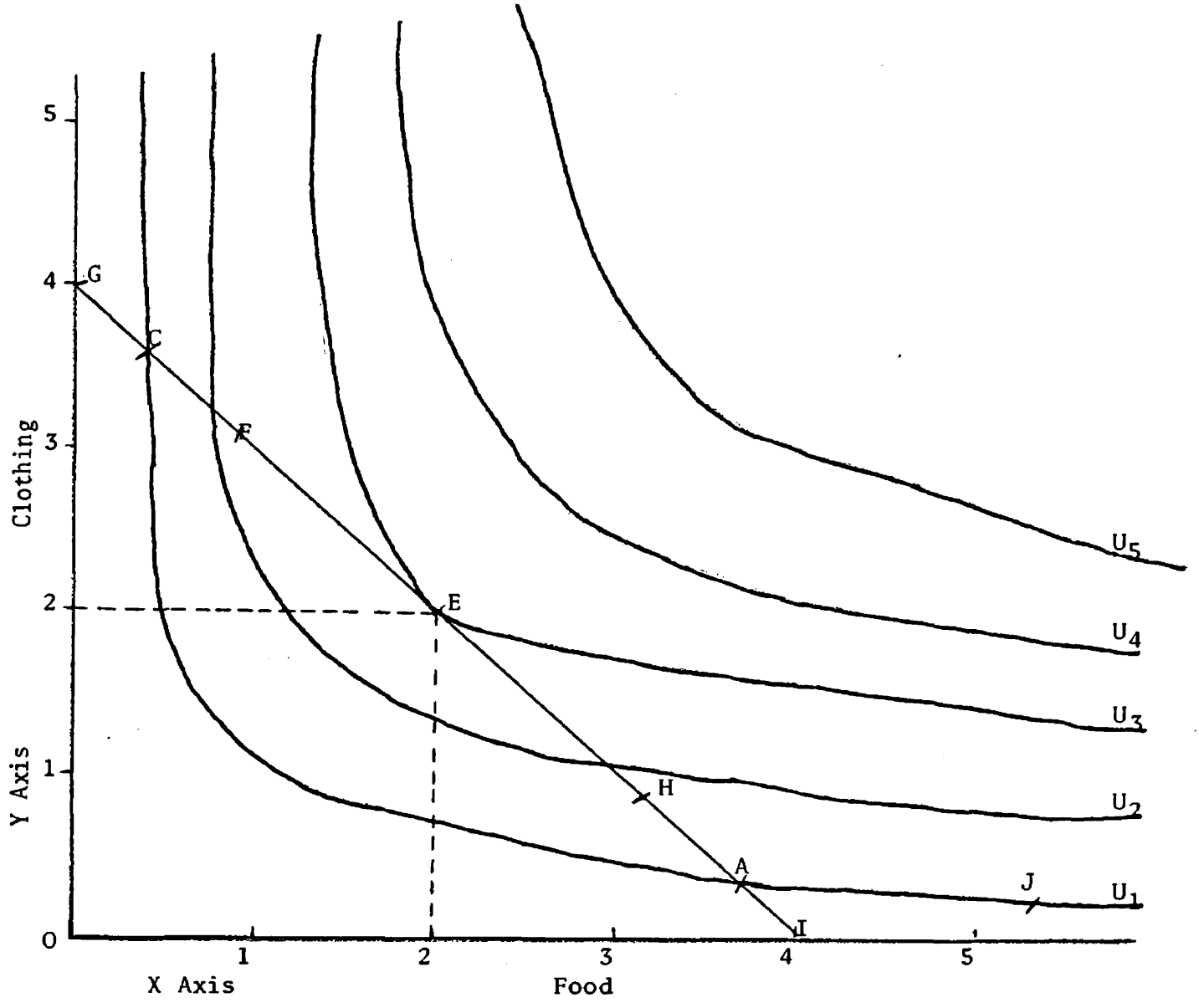

Figure 2:1

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[1]Ithiel De Sola Poole, "Deterrence as an Influence Process," in Pruitt and Snyder (eds.), Theory and Research on the Causes of War (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969), p. 189.

food and clothing, but has not decided what portion of that total he should spend on either one. Since the individual is assumed to be a utility maximizer, he will want that combination of goods which will make him most content, i.e., which have the highest utility value for him. His choices are not unlimited. The limitation is supplied by the budgetary consideration which restrains his spending, and by the prices of the goods. In Figure 2:1, the cost per unit for clothing and food is the same. These constraints are illustrated in Figure 2:1 by the "consumption-possibility line" from G to I. Given the amount of money which O has decided that he will spend on food and clothing, he can buy only those combinations of food and clothing which fall on the consumption possibility line or lie to the southwest of it. In other words, O can buy: 1) four units of clothing and no food, point G; 2) three units of clothing and one unit of food, point F; 3) two units of food and two units of clothing, point E; 4) three units of food and one unit of clothing, point H; 5) four units of food and no units of clothing, point I; or 6) any fractional division of the units found on line GI.

The problem still remains for O to decide which of these five choices will make him most content. The answer is based upon the shape of the indifference curves which fill the map. The indifference curves are those lines which fill the figure and which generally follow the right angle formed by the intersection of the X and Y axes. Each one of these lines represents a specific utility level which O could reach if he purchased any combination of the goods found on the lines. The labeling of the lines with U followed by a number from one to five refers

to the value of that particular line. Line U_5 has the highest value on the map, and line U_1 has the lowest.

Individual O could reach utility level U_1 by purchasing any of the combinations along the indifference line U_1. In other words, he will be equally well off with purchases at points A, B, or C. Note, however, that he cannot make the purchase at point J because that is not within the consumption possibility line. The lines are called "indifference curves" because they state a relationship of indifference to all points on a given line. The fact that O is equally well off at points A, B, and C states also that he is indifferent to all of those combinations.

If O purchases the mixture of goods represented by either A or C, he will have spent all of his budgetary allotment and have risen only to utility level U_1. There are indifference curves of higher value which intersect the consumption possibility curve. If O is attempting to maximize his utility, therefore, he must not purchase either combination A or C. He must purchase that mixture which places him on the highest utility level which he can attain given the limitations of his budget. That point is point E. At point E, the individual is at the highest utility level which the consumption possibility line touches. Any point other than point E will place O on a lower utility level. At this point O will buy two units of clothing and two units of food.

The indifference curves of Figure 2:1 are appropriate for the man who can best satisfy his desires with equal combinations of food and clothing. But not everyone has such tastes. Figure 2:2 illustrates

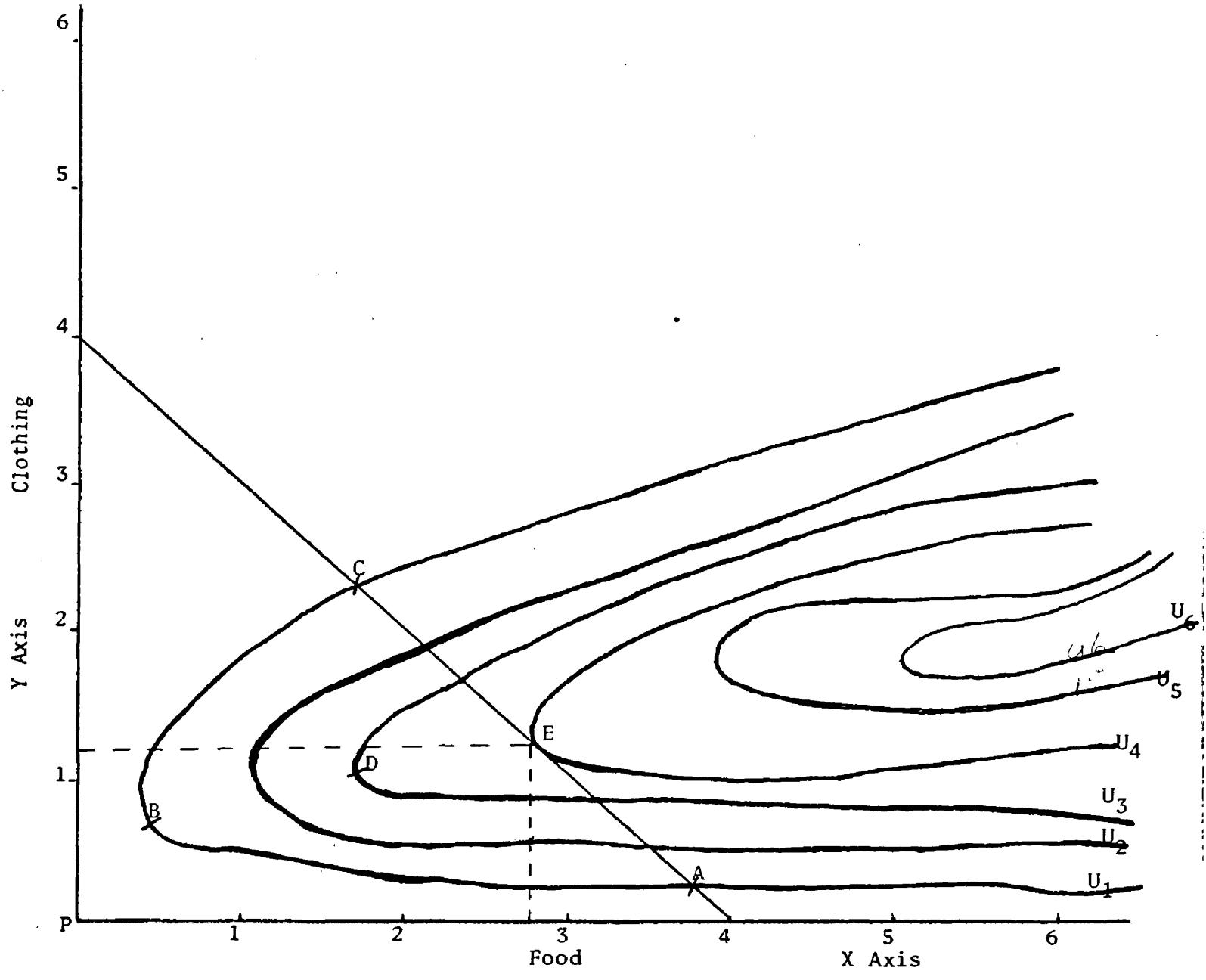
6
5
4
3
2
1
P
Clothing
Y Axis
1
2
3
4
5
6
Food
X Axis
C
B
D
E
A
U6
U5
U4
U3
U2
U1

Figure 2:2

the same problem as Figure 2:1 where the individual has a greater preference for food than for clothing. The consumption possibility line is the same, but the combination of goods which maximize the utility of this individual, P, is different because of his different preferences. Point E, representing this point, calls for the purchase of two and three-quarters units of food and only one and one-quarter units of clothing. If an individual had preference for clothing over food, the indifference curves would look like those in Figure 2:3 and the resulting utility maximizing combination would be at point E. At that point about one and one-quarter units of food would be purchased and about two and three-quarters units of clothing.

This discussion relates to deterrence in the interaction between individuals in the following way. Suppose that individual O is about to purchase two units of food and two units of clothing. Another individual, Q, whose utility map is represented in Figure 2:3 would rather have O purchase more food and less clothing. Q would prefer this because clothing is scarce and if O purchases two units, there will not be enough left for Q to purchase two and three-quarters units. Q wants, therefore, to deter O from purchasing two units of clothing and food, and to force him to buy more food and less clothing. The only way he can do this is by forcing O to change his perception of his utility map. To achieve this desired end, he may threaten him with punishment if he buys two units each of clothing and food. If O believes the threats, the utility of his planned purchase will have been changed. No longer would it be the best way to spend his money.

O will do better to spend more money on food and less on clothing. The change in his utility perception can be represented as the change between the indifference curves of Figure 2:1 and Figure 2:2.

Before drawing the analogy between the individual and the nation-state as maximizers of utility, one additional fact about indifference curves should be noted. It may be that an individual would regard neither clothing nor food as beneficial to him. While such a person might never exist, his preference may still be represented by an indifference map. However, in Figure 2:1, instead of labeling the indifference curves with increasing utilities, they would have to be labeled with decreasing utilities. Therefore, U_5 would be labeled U_1, indicating that instead of being better off at this higher level of consumption of food and clothing, the individual was worse off. U_1 would be labeled U_5, and as before, the individual would be increasingly well off as he moved from utility level U_1 to U_5. The only difference being that well being would be increased through lesser amounts of consumption than greater amounts. In such a case, utility would be maximized with no expenditure.

The State as a Utility Maximizer in International Relations

The analogy is made between the individual as a utility maximizer and the state. Figure 2:4 illustrates this analogy with an indifference map which is identical to the one in Figure 2:1, but which is expressed in terms of interstate interaction. State O is attempting to develop policy for its interactions with another state. The decision makers

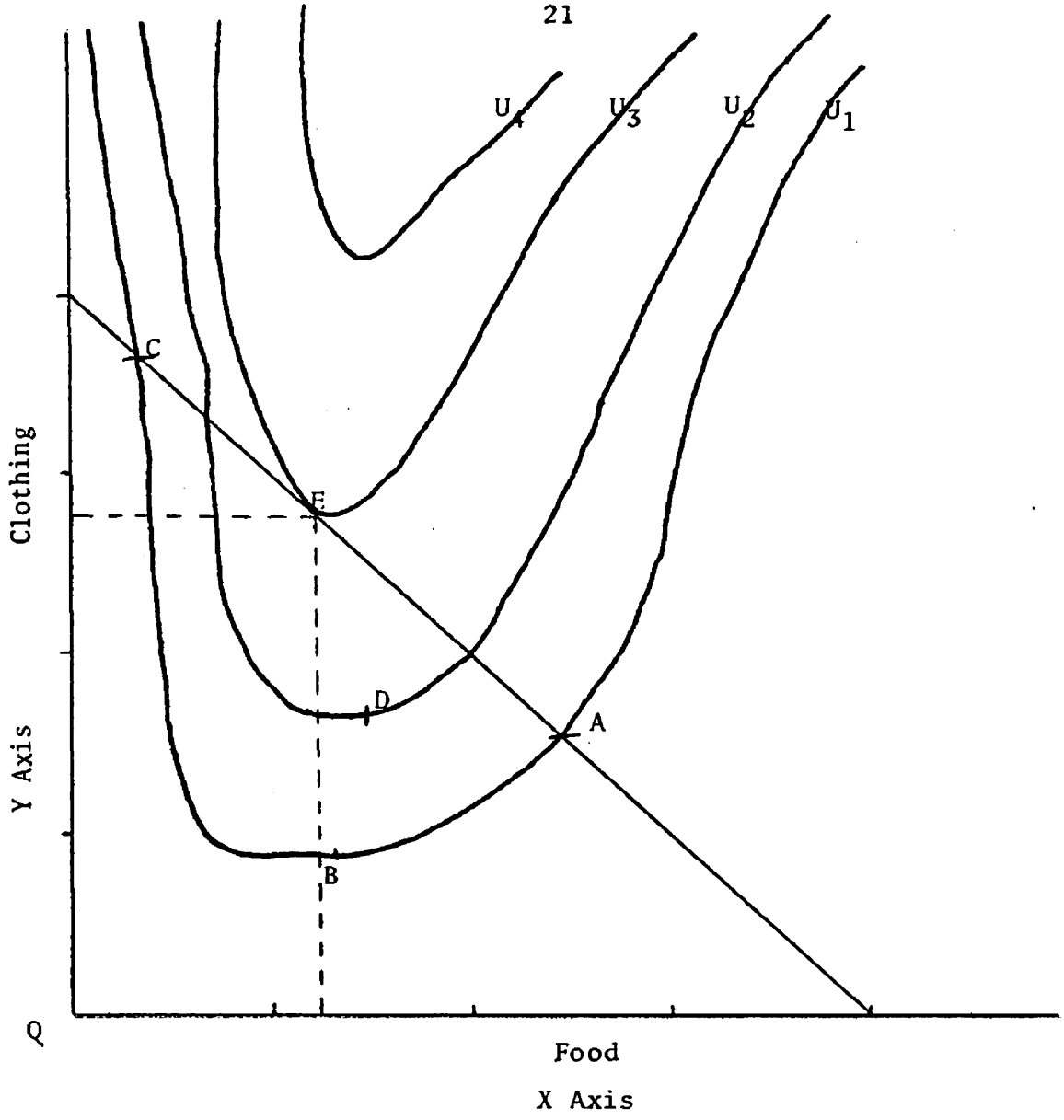

Figure 2:3

have decided that in general, interaction will be valuable for O, and have decided to allocate a certain amount of O's political, economic and diplomatic resources for the development of increased interaction. Interaction may be increased either through greater competition with the second state or through greater cooperation.

In the purely economic illustrations, the individual could increase his utility through the purchase of some quantity to food and clothing. For the state, it may increase its "national interest" through its dealings with other states by interacting cooperatively or competitively. The combination of cooperative or competitive dealings upon which O eventually decides will depend entirely upon what its decision makers perceive will be the consequences of their actions in terms of the benefit to the state. If the decision makers believe that by cooperating with the second state that more will be gained than by competing with that state, then cooperation will be the policy. If competition appears to be more fruitful, then the resources will be used for competitive interaction.

War is the most extreme form of competitive interaction, but there are others. One rationale for American foreign aid has been that competition between the United States and the Soviet Union existed with regard to allegiance of the underdeveloped nations. So, expenditure on foreign aid for the purpose of limiting the influence of the Soviet Union is an example of competitive interaction between the United States and the Soviet Union.

One example of cooperative interaction is the European Economic Community where the nations of the Common Market cooperate in the

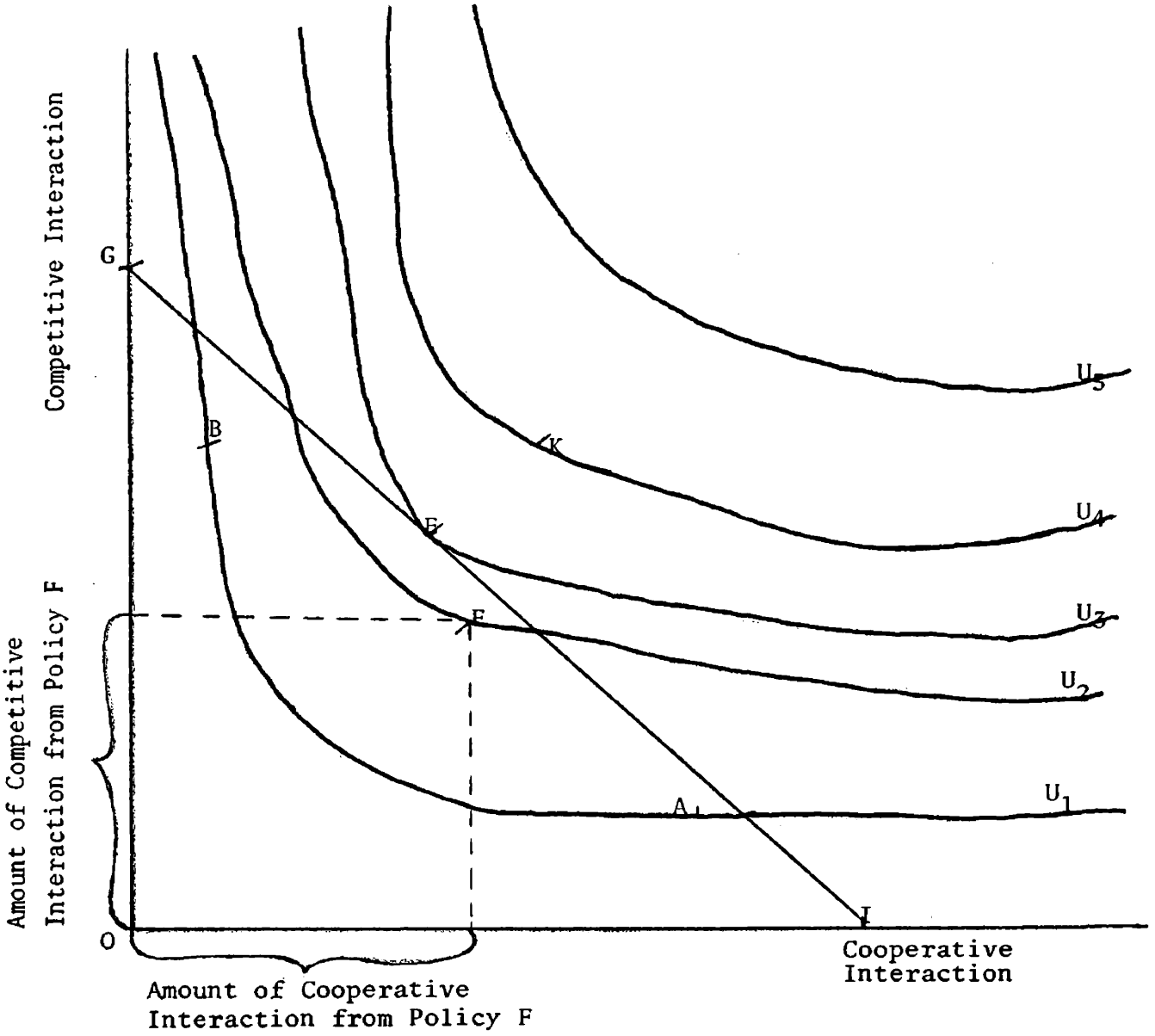
Competitive Interaction
G
B
K
F
E
U_5
U_4
U_3
U_2
U_1
A_1
I
O
Amount of Competitive Interaction from Policy F
Cooperative Interaction
Amount of Cooperative Interaction from Policy F

Figure 2:4

creation of uniform economic policies. The decision makers of the six states which form the Common Market believed at the time of its formation that the national interests of their respective states could best be maximized through cooperation of this nature.

In Figure 2:4, the line GI is the same as the consumption possibility line in Figure 2:1. This line indicates all of the possible combinations of interactions which could be carried out within the budgetary limitations imposed by the decision makers. The type of policy which best maximizes utility in this example would be a combination of cooperation and competition, as indicated at point E.

But, unlike the problem which confronted the individual in the economic examples, the decision makers for a state will not be able to choose among an infinite set of alternatives. The choices available to the policy maker may be very limited indeed. Because of this, there may instead be only a few policy alternatives, some of which come closer to point E than others. Point K might be a desirable policy, but it is not within the confines of the budget. Points A and B are within the budget, but they do not raise the utility of the state as high as point F. The policy which comes closest to point E is point F. Therefore, the decision makers of state O will have to settle on policy F as coming the closest to maximizing the benefits to the state.

If the decision makers of state O believed that the national interest could best be maximized by competition with another given state, the indifference curves would look like those in Figure 2:3.

Deterrence of an act is brought about through the same process illustrated earlier in the economic examples. If a second state does

not wish that state O carry out policy F, but would prefer that it carry out policy A, the second state must change the relative utilities of actions F and A as perceived by O's decision makers. If the second state is successful, then it will have changed the utility map of O from Figure 2:4 to that illustrated in Figure 2:5. In Figure 2:5, action A is above indifference curve U_3, while action F is below it. By definition action A is more beneficial.

If a given utility map correctly represents all of the utilities relevant in the actions of the decision makers, it is a tautology to state that the decision makers will always carry out policy decisions which will place their state at the highest utility level possible within the given budgetary restriction. All actions other than those which place and maintain the position of the state at such a level will be, by definition, deterred. The extent to which one state can influence the utility perceptions of the decision makers of another state will determine the degree to which it can deter undesired actions by the latter. If the decision makers of one state can convince the decision makers of another state that the action which is undesired by the first will place the second on a point which is below the utility level now held by the state, then the action will be deterred.

Suppose that in Figure 2:4, the decision makers of state O were contemplating a change in policy from A to E. Such a policy would involve a higher degree of both competitive and cooperative interaction. In addition, such a change would, according to the utility map in Figure 2:4, increase the benefits of interaction from U_1 to U_3. Suppose that the second state in this interaction wished to deter such a change.

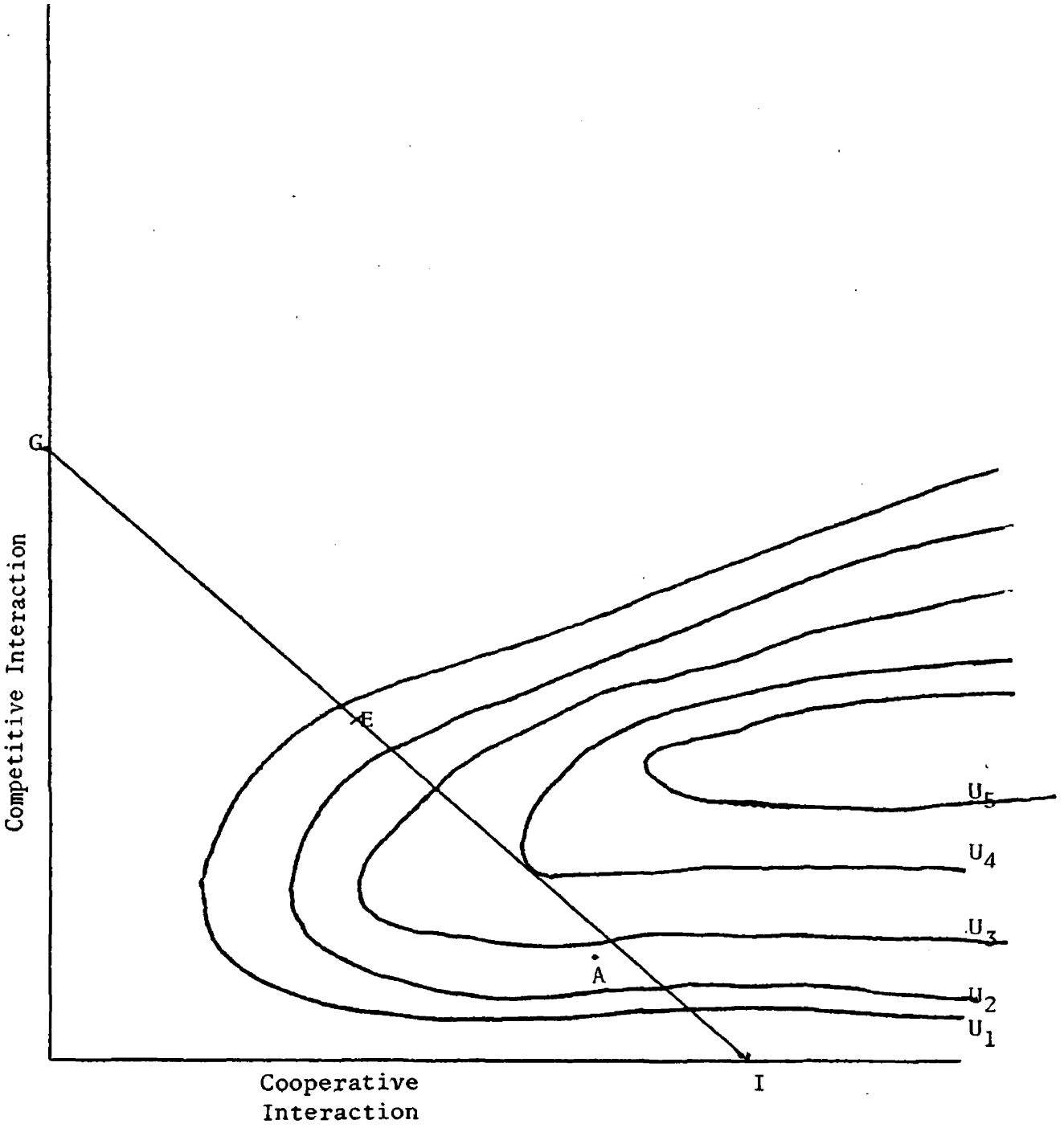
G
Competitive Interaction
E
A
U_5
U_4
U_3
U_2
U_1
Cooperative
Interaction
I

Figure 2:5

It would have to communicate to O and convince the decision makers of O that the move would not be beneficial in comparison to another policy alternative. If the decision makers of O become convinced, then they must change their conception of the utility map of interaction with the second state. It might look like that of 2:5, where action E would be detrimental to state when compared with policy A. No policy makers would decide upon a policy which would lower the utility level of interaction and therefore, action E would be deterred.

The "game" represented in Figure 2:6 illustrates the process of interaction between two states which can result in deterrence.[2] This interaction process cannot be illustrated through the use of the utility map of only one of the participants alone. Here point AB is the status quo position and North has the opportunity to make the first move in the game. North would prefer to move to aB, and would therefore prefer to choose a. But East has threatened that if North chooses a, East will choose b, moving them both to position ab. That position is mutually disadvantageous with respect to the status quo and point aB. But point aB is disadvantageous to East in comparison to the status quo. East is attempting, therefore, to deter North's move to a. It desires the maintenance of the status quo. It is attempting to deter the action by convincing North that if it chooses a, the result will not be the utility suggested by point aB, but that suggested by point ab. The degree to which North believes the

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[2]See Thomas C. Schelling on "game theory" in Strategy of Conflict (Cambridge: Harvard University Press, 1963).

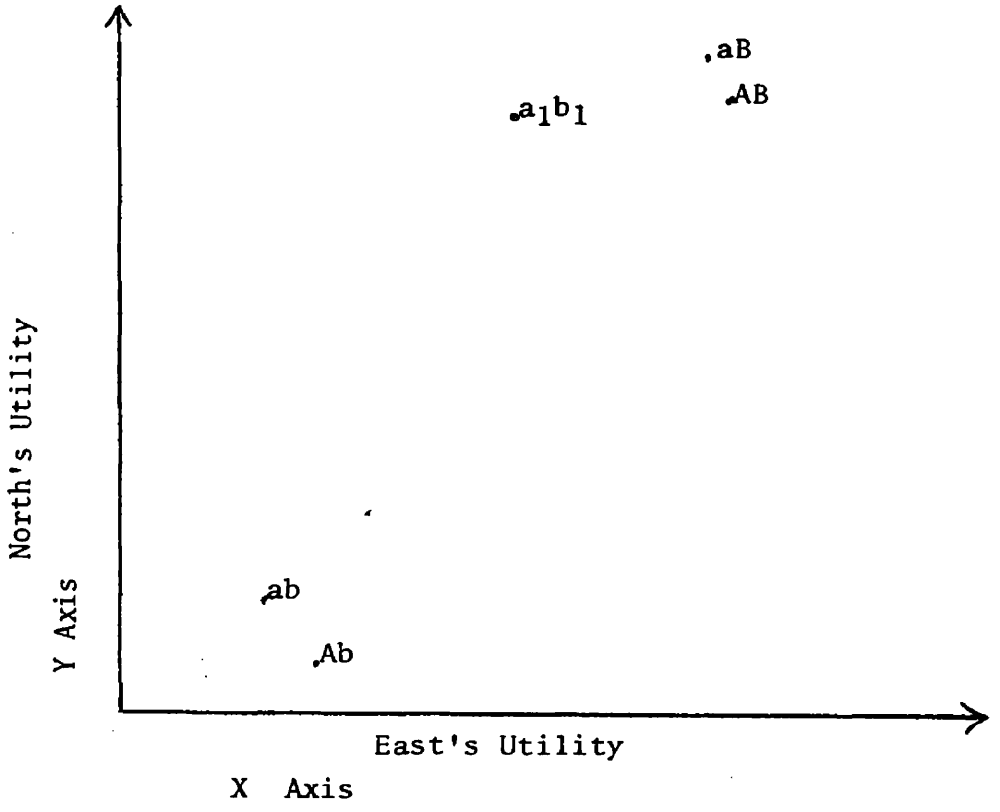

Figure 2:6

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[3]Glenn H. Snyder, Deterrence and Defense: Toward a Theory of National Security (Princeton, N.J.: Princeton University Press, 1961), p. 19.

threat of East will determine whether North chooses to remain at the status quo position or not.

If this game consisted of only one move on the part of both players, there would be little reason for North to believe the threat of East. If East carried out the threat, then both players would be placed at a disadvantage. It would be to the best advantage of East to choose B and move to position aB. Real world interactions are not a one time only affair, however, East may realize that a move to ab would place it at a disadvantage over the short run, but that over a long run certain utility would result from such a move. This utility would take the form of increased credibility of its threats in the future. If North did not believe East's threat this time, it would choose a. If East then carried out its threat and chose b, the credibility to North of any of East's future threats would be enhanced.

East's threat will succeed if and only if it has created the conditions which make its threat credible to North. Those conditions might include moral, political or economic considerations, or any other factors which might impress upon the decision makers of North its willingness to suffer. If East's threat is credible, the status quo position will be maintained. If the threat is not credible, North will choose a. East will then have to decide whether the future credibility of its threats will be advantageous enough to it to warrant the fulfillment of its threat.

This identifies a distinctive feature of the threats upon which nuclear deterrence is based. "The threatener has

> no short range incentive to carry out the threat . . . . He does have an incentive to bind himself to fulfill the

> threat, if he thinks that the threat may be successful, because the threat, and not its fulfillment gains the end; the fulfillment is not required if the threat succeeds. The more certain the contingent fulfillment is, the less likely is actual fulfillment,"[4]

provided that increased certainty of the fulfillment of the threat is communicated to the second player in the game. It is also contingent upon the threat being sufficient to deter the action, and upon being interpreted as such by the second party. If, for example, North in Figure 2:6 thought that point ab was located in the position of point a_1b_1, it would not be deterred even if East's threat were completely credible. The reason for this is obvious, North would lose nothing even if the threat were carried out.

The credibility of a threat is rarely an absolute condition. It must be expressed in probabilistic terms. Singer integrates the question of probabilities into the utility model of deterrence.[5] Figure 2:7 illustrates this integration. In this figure, the decision makers of a state which has seven policy alternatives have attempted to label the utility of each alternative and also the probability that the labeled utility is correct. An attempt has been made to gauge the possible disutility of each action, and the possibility that the outcome would result in the given disutility. The decision makers of this state can then determine the action which is most likely to result in the highest

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[4] Ibid., p. 35.

[5] J.D. Singer, Deterrence, Arms Control and Disarmament: Toward a Synthesis in National Security Policy (Columbus, Ohio: Ohio State University Press, 1962) Chapter II.

utility through the following process: multiplication of the possible utility times the probability that the action will result in that utility. From this product is subtracted the product of the disutility of failure. The action which predicts the highest utility is the one which the decision makers will choose to take.

While this may describe a process which takes place among the decision makers of the nations of the world, the actual process must be a far cruder method.

Deterrence is dependent in this model upon the deterrer's ability to impress the second state with the magnitude of the disutility of an act and the probability that the state, i.e. the credibility of its threat to make the action result in lower utility for the second state.

Note that deterrence need not depend upon a high degree of credibility. Action E, which the decision makers of the state give an 80% chance of success to, is effectively deterred by the 20% possibility that it will end in absolute disaster.

To summarize: Deterrence is a condition which is based upon the utility perceptions of the decision makers of a state. Any action which the decision makers of a state take is, by definition, the action which they perceive will maximize the utility of the state. All actions which are not taken are, also by definition, deterred. They are deterred because, in the opinion of the decision makers, they will not result in the maximum utility for the state.

For one state to deter the actions of another, it must be able to exert some control over the perception of the utility of various actions

	(Probability x Utility) - (Probability x Disutility)	probable utility
Action A	(.9 x 100,000)- (.1 x 10,000)	= +80,000
Action B	(.8 x 10,000)- (.2 x 10,000)	= +6,000
Action C	(.2 x 100,000)- (.8 x 10,000)	= +12,000
Action D	(.3 x 10,000)- (.7 x 10,000)	= -4,000
Action E	(.8 x 10,000)- (.2 x 100,000)	= -12,000
Action F	(.1 x 10,000)- (.9 x 100,000)	= -80,000
Action G	(.9 x 10,000)- (.1 x 0)	= 9,000

Figure 2:7

which are held by the decision makers of the latter. This control will depend upon the magnitude of effect which the first state might be able to exert upon the utilities of the second as perceived by the decision makers of the second state. It will also depend upon their perception of the probability that any threats or promises based upon that perceived capability will be carried out. Last, it will depend upon the existence of alternate actions for the second state to take which, as a result of the actions of the first state, now have a higher probable utility than any of the actions which the first state was attempting to deter.

CHAPTER III

NUCLEAR DETERRENCE

> "If we try to get at the ultimate logic of the idea of protection through weapons which must not be used in actual practice, we seem to arrive at a mere bluff. These bombs can protect peace and freedom only on condition that they never fall, for if they should ever fall there would remain nothing worth protecting. But, on the other hand, they cannot protect us either if everyone assumes that they will never be dropped, for then the opponent can act as if they did not exist. Ergo, we must be determined to drop them if necessary, and this means that they may very well be dropped one day."[1]

When the United States developed the atomic bomb, it provided itself with an instrument of influence the magnitude of which was inconceivable of a few years previously. The conjunction of the development of nuclear arms and the seemingly limitless aggressive aims of the Soviet Union induced the leaders of the Western World to fall back upon nuclear deterrence for protection from the communist threat. The overwhelmingly devastating power of nuclear weapons was seen as the best protection against the spread of communism throughout the nations of the North Atlantic community. No Soviet ruler, however irrational, could find utility in aggression which might bring nuclear devastation to his country.

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[1]Carl Freidrick von Weizsacker, quoted in John Herz, International Politics in the Atomic Age (New York: Columbia University Press, 1959) p. 189.

During the period when the United States alone was in possession of nuclear weapons, the problem of deterrence was a comparatively simple matter. If the Soviet Union attacked Western Europe, it could expect that the United States would retaliate against it with nuclear weapons. The leaders of the Soviet Union may not have been absolutely convinced that the United States would retaliate with nuclear weapons. Nevertheless, the possibility of it, in combination with the power of nuclear weapons, may have been enough to deter any conventional attack in Western Europe.

As soon as the Soviet Union gained its own nuclear potential, the situation changed fundamentally. No longer was the United States in a position to control Soviet activity through the threat of nuclear retaliation with no fear of similar devastation being wreaked upon itself. Both states were now in the position of being able to destroy the other as a working socio-political unit in the event of nuclear war.

This chapter attempts to synthesize a model of nuclear deterrence from the most recent literature on the subject. Various problems associated with nuclear deterrence are discussed in the hope of providing a necessary background for the following discussion of the anti-ballistic missile.

Stable Nuclear Deterrence

If nuclear war were started, the initiator of the nuclear exchange would realize certain benefits simply as a result of being the initiator. It would have undoubtedly destroyed a portion of the nuclear force of its enemy. As a result, any retaliatory strike which the latter carried

out would be considerably less potent than a first strike initiated by that state. In addition, the initiator would be able to take advantage of increased warning time for the defense of its population and its remaining nuclear capability. The initiator, unlike the defender, will not be in complete surprise when and if there is a retaliatory strike. The initiator will be able to plan on there being a retaliatory strike and take defensive measures for the protection of its population and remaining nuclear force even before it launches its attack. The defender will have only from the time it determines that an attack has been launched to the time of the impact of the first strike to make similar preparations. If the attack is started with ICBM's, this time will be no more than thirty minutes, which is the approximate time required by the ICBM to travel between the United States and the Soviet Union. If the attack were started with submarine launched missiles, this time would be even less. This time would be enough for defense crews to be alerted about the imminence of an attack, but it would not be long enough to allow them to make any kind of preparations to meet the attack. They would have to be ready to respond to the attack when it came. And thirty minutes would certainly not be enough time to mobilize the population of the defender and move them even to fallout shelters, much less to areas away from presumed targets.

The attacking state, on the other hand, could initiate the movement of people to safety hours before it chooses to launch its missiles. The attacker also has the advantage of being able to place its active defenses in a high state of alert. The knowledge that a retaliatory strike will be forthcoming sometime within an hour after the launching

of the attacking missiles may contribute very significantly to the effectiveness of the active defenses of the attacker.[2] The active defenses of the nation being attacked may always be technically in a state of alert, but it is impossible to maintain a state of alert equivalent to that of the attacker when the defenders do not know when, if ever, an attack will come.

For a nuclear deterrent to be effective in the face of the advantages which accrue to the initiator of a strike, four elements are essential. First, the deterring state must have a nuclear force which will deliver a punitive blow to the attacker which would completely negate any possible utility which the attacker might gain as a result of the attack. It must be able to deliver such an attack even after the following disadvantages: 1. The toll exacted by the first strike; 2. The field degradation of its own weapons systems;[3] 3. The attrition upon the retaliatory force caused by the enemy's active defenses and; 4. The increased ineffectiveness of the defender's strikes against population centers because of the civil defenses of the attacker.

Secondly, since there will always be an advantage to striking first, the deterrent must not give the impression that the state is, in fact, planning to strike first. If one state in the system conveys that impression, it would be to the benefit of any other state to preempt

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[2]Active defenses include such things as anti-aircraft, fighter interceptor aircraft and anti-ballistic missile systems.

[3]The efficiency of any weapons system decreases when it is put into the field in comparison to its efficiency under testing conditions. This deterioration is called "field degradation."

that strike. A deterrent which conveyed that impression would be likely to induce nuclear attack rather than deter it.

Third, the capability of the deterrer must communicate the intent to retaliate. Lastly, any potential attacker must know that the deterring state has the capability defined above. A state does not enchance its security from attack if its capability is unknown to a potential enemy.[4]

Capability Requirements

The deterring state must attempt to assess the level of destruction which the potential attacker would deem unacceptable even if the nuclear first strike did achieve its objectives. The prejudice of military planners is likely to dictate a perception of an enemy willing to tolerate a high level of suffering within it. In addition, the fact that the deterrence planners will be operating under conditions of uncertainty about the values of the enemy will lead them to estimate liberally the amount of destruction which would be needed to achieve certainty that the enemy's threshold of unacceptable damage had been reached.

Once that threshold has been defined, in terms of population and industrial capacity destroyed, the planners then must determine the quantity of warheads of given levels of megatonnage which would achieve that level of destruction.

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[4]A. Wohlstetter, "The Delicate Balance of Terror," Foreign Affairs, Jan. 1959, p. 216.

From this point, the planners must simply work backwards to determine the number of warheads and bombs which must be produced and capable of being delivered, to be reasonably certain that if attacked, the aggressor would receive an intolerable punishment in return. This number is dependent upon the following variables:

1. Efficiency of the enemy's active defenses: Active defenses include all of those devices which actually seek to intercept and destroy the attacking force. These include anti-aircraft installations, fighter-interceptor planes and anti-ballistic missile systems.

2. Effectiveness of the enemy's passive defenses: Passive defenses are all those preparations which can be made to attenuate the effects of an attack which do not attempt to stop the attack while it is in progress. The passive defenses of a state are likely to include civil defenses, dispersal of bomber and missile forces, hardening of missile bases and increasing the mobility of the missile and bomber force. While the attacker might be able to move a substantial portion of its population to the safety of bomb or fallout shelters away from target areas, there is virtually nothing which can be done to protect its industrial complex. It would not be economically sensible to harden all of the industrial facilities of a state. Nothing short of being buried several hundred feet below ground would be able to protect against missiles which have the accuracy of the present ICBM's. Such protection would be obviously impossible for an industrial sector of any size.

Passive defenses for missile and bomber bases would be of value to the attacker as well as the defender. It is assumed that the aggressor

would not launch his entire nuclear force in the first round of the exchange. A portion of the force, perhaps the larger portion, would be saved to use in any bargaining which might follow the first round of a nuclear exchange. It would be of little use for an aggressor to expend all of its nuclear capability in the first attack and then have no further means through which to threaten its enemy.[5] Thus, it is to the attacker's advantage to make at least a portion of its nuclear force as invulnerable as possible to the defender's retaliatory strike.[6]

The fact that the attacker would have eliminated a portion of the defender's retaliatory force makes the process of defending the remaining missiles an easier task. Passive defenses would make a further contribution. Missile bases can be hardened to withstand very near misses from incoming missiles. Hardening does not yet andin all probability never will ensure complete invulnerability for missiles. Nothing except burial inside of mountains would protect against a direct hit by a nuclear warhead. The increasing size of missile warheads and the increasing accuracy of them decrease the effectiveness which hardening alone can afford the remaining missiles. Nevertheless, it does offer a measure of increased invulnerability, even if it is far from perfect.

Dispersal is another form of passive defense. If all missiles or

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[5]This assertion might not be the case if the nuclear exchange were initiated in order to preempt the nuclear strike of the second state. In such a case, the initiator might use all of its nuclear force in an attempt to minimize the effect of the anticipated strike by the second state.

[6]J.D. Singer, "Stable Deterrence and Its Limits," The Western Political Quarterly, 1962, pp. 452-456.

bomber aircraft operated out of only a few bases, it would be an easy matter to destroy those few locations. A number of ICBM's could be targeted for each base. A resonably small number could result in the certain destruction of those bases. Dispersal requires that the enemy build additional capabilities in order to be certain of the destruction of all bases. If the enemy has the resources to build the additional capability, and can locate the dispersed sites, dispersal loses some of its merit. If the enemy hasn't the resources, or chooses not to utilize them, dispersal will insure the invulnerability of some of the missiles. This has been the case at least until very recently in the relations between the United States and the Soviet Union. The missile force of the United States has been so dispersed that it would require at least one Soviet missile to be targeted against each individual ICBM. Since the Soviets had fewer ICBM's than the United States, at least a portion of the American force is invulnerable.

If the bases can be concealed from the enemy, they will obviously be invulnerable to attack. Actual physical concealment of land-based missiles is difficult, if not impossible. However, the same effect can be achieved through mobility. While this concept has not been applied to landbased missiles, the Polaris-Poseidon submarine-based missile force has put it to outstanding use. As long as no effective means of tracking nuclear submarines exists, and there is no reason to believe that there is, they will remain completely invulnerable to attack.[7]

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[7]Edmund J. Gannon, "Projected Strategic Weapons Systems: Some of the Considerations Relating to Their Development and Deployment," Library of Congress Legislative Reference Service, July 7, 1970, Washington, D.C., p. 13.

The invulnerability of a force can also be guaranteed by giving it the capability to be launched, in the case of missiles, or take-off prior to the impact of the first of the attacking missiles. Unfortunately, it is very expensive to keep bombers in such a high state of readiness. The question of launching missiles prior to the impact of the attacking missiles will be discussed later.

3. Effectiveness of the deterrer's active defenses: Just as the active defenses of the attacker affect the number of warheads which reach their target from the retaliatory strike of the deterrer, so the deterrer's active defenses affect the number of warheads reaching target within its own territory.

It is assumed that any first strike will be principally a counter-force strike. A counter-force strike is an attack which is aimed at the strategic force of the opposite state. By destroying a portion of the strategic force of the opposite state, the attacker will be able to mitigate the effects of the retaliatory strike.

Since a first strike will be counter-force, the effectiveness of any active defenses will have a direct bearing upon the remaining number of missiles with which the defender could retaliate. In the absence of an effective anti-ballistic missile system, the effect of active defenses upon a first strike would be limited to the effectiveness of our anti-bomber defenses, should bombers be used.

4. Early warning systems: If the deterrer's early warning system can provide early and unequivocal proof of an enemy attack, the deterrer would be given additional time which might be valuable in reducing the effects of the strike. Since a perfect early warning system could not

give more than thirty minutes warning, the effect of the few additional minutes is likely to be small.

5. Deterrer's passive defenses: Just as for the attacker, the effect of the passive defenses of the deterrer will bear upon the size of the remaining nuclear force. Some, like the dispersal of aircraft to get them airborne will depend upon the amount of warning time by the early warning system.

6. Numbers of warheads launched in the first strike, their yield, accuracy and the reliability of their delivery systems: This is the final variable which must be considered in the deterrence equation. The higher the number of weapons, the greater their yield, accuracy and reliability, the larger the portion of the deterrer's nuclear force will be destroyed. For a state to maintain an effective deterrent, it would require a larger nuclear force, in proportion to the number, accuracy, reliability and yield of the enemy's.

A salient feature of the process by which the nuclear capability requirements of effective deterrence are determined is that there can be no sense of absolute certainty that the capabilities arrived at will be correct. This process has the appearance of providing a kind of scientific certainty about the problem. Unfortunately, all of the calculations may founder upon the one factor which cannot be measured in any scientific fashion: the value which the enemy places upon the destruction of its own resources. The certainty of having to suffer one million casualties might be enough to deter one set of decision makers from a nuclear strike while certain destruction of ten million people might not deter another.

The armed forces analysts will attempt to gain certainty of deterrence through their conservative estimations. But even these conservative estimates cannot produce absolute certainty.[8] At some point the decision makers must decide what constitutes adequate, albeit imperfect protection from a nuclear first strike. In a representative form of government, it would be a political question, largely determined by the political forces in the state. In a non-representative form of government it would be determined by some combination of decision makers.

Figure 3:1 illustrates the decision making process involved. Nation X has a national wealth of $\hat{x}_o$, which is measured on the Y axis. The wealth can be converted into strategic weapons which would remain after a first strike according to the ratio measured by line C. Line C reflects the cost constants involved and also reflects a constant number of incoming enemy warheads and planes of a given reliability, accuracy and weapons yield. It rises from the right to the left because of the economies of scale which can be realized in strategic arms production.[9] The Y axis measures the strategic weapons which would remain to nation X, after a counter-force strike of constant force by another state. The amount will vary in proportion to the arms production of state X.

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[8]Robert S. McNamara, The Essence of Security, (New York: Harper and Row, Publishers, Inc. 1968) Chapter IV.

[9]Economies of scale are those economies in unit cost which result from longer production runs. The price per unit will decrease as production increases if there are economies of scale.

At some point on this map, the utility of state X can be maximized with respect to its production of strategic goods. In figure 3:1 that point is point B, where the cost curve C is tangent to the highest utility curve which it ever touches. The amount of national wealth spent on strategic goods is the distance from x_0 to x_1. This leaves that portion of national wealth from x_1 to x_2 to be retained for other purposes. If state X spends any other amount of resources on strategic goods than the amount indicated at point B, the state will be placed at a lower utility level. If the decision makers spent more than at point B, such as point L would indicate, the state would be lowered to the utility level U_{-1}. If they spent less than was indicated, such as at point M, the utility of the state would be lowered again, this time to U_{-2}.

At point B, state X can be reasonably certain that Zx_1 amount of strategic weapons will survive an enemy counter-force attack. It also states that the decision makers of X are reasonably confident that Zx_1 amount of missiles and bombers will be able to inflict unacceptable damage upon an attacker. They are certain enough of this so that any utility which might result from an increase in certainty, through greater spending on strategic weapons, would not be commensurate with the utility which would be derived from spending on other goods. Stated another way, at point B the marginal utility of one dollar spent on strategic goods is not equal to the marginal utility of one dollar spent for other purposes.

This model explains why defense spending tends to level off for any given capability of the enemy. It also suggests that if the enemy increases it strategic capability, which would be represented by a

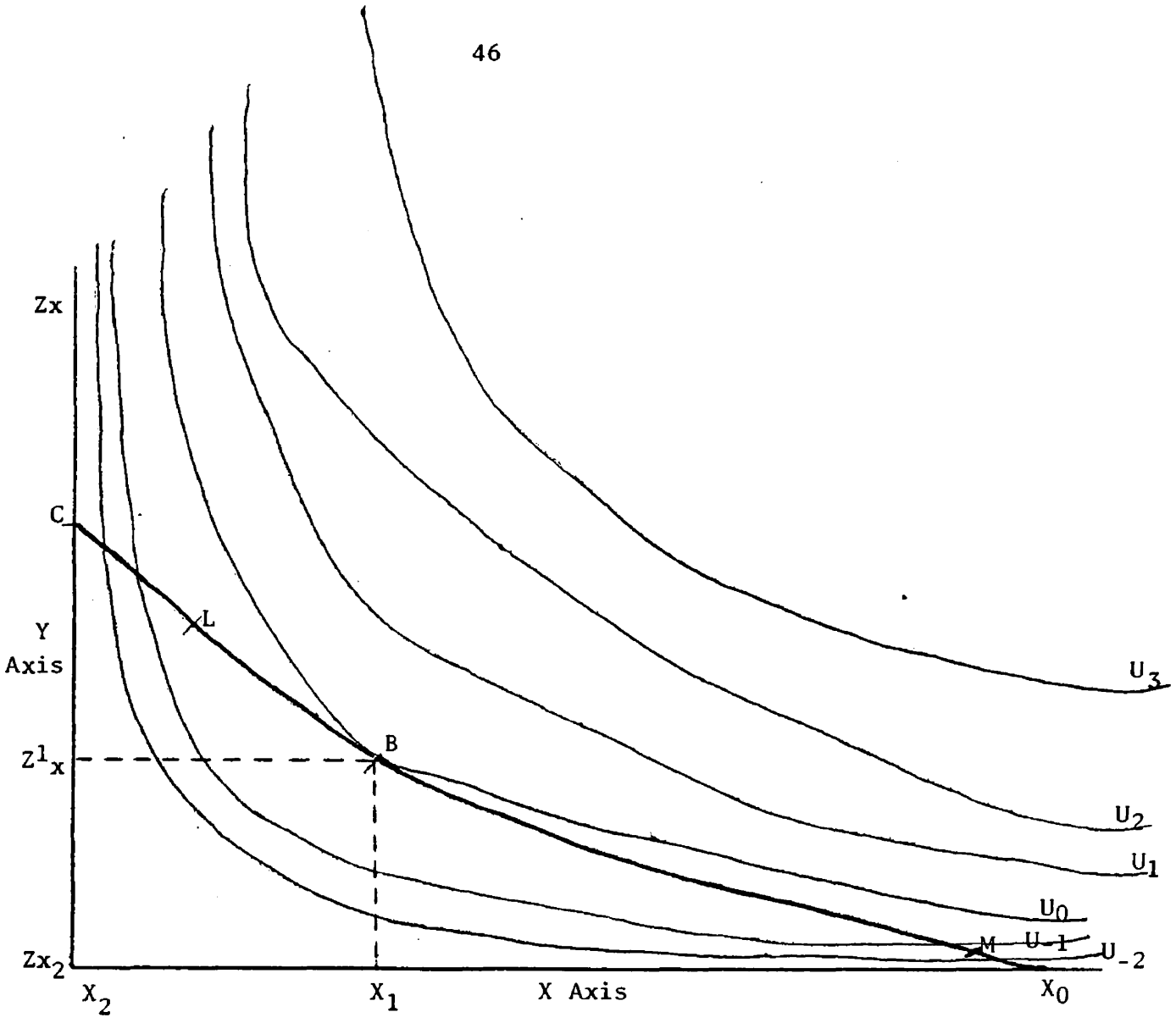

Figure 3:1

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[10]Martin C. McGuire, Secrecy and the Arms Race (Cambridge: Harvard University Press, 1965), p. 16.

movement of the cost curve toward the X axis, that state X would also be forced to increase its level of strategic expenditure.

Credibility

A definition of the capability requirements of deterrence is only one-half of the problem of successful deterrence. The other half consists of two parts. First, it is essential that the deterrer convince any potential aggressors that it has the military capability to inflict unacceptable damage in retaliation to an attack. Secondly, it must also convince the potential aggressors that its retaliatory capability will be used.[11]

The problem of demonstrating military capability for the benefit of a state's enemy is easily enough solved. Demonstrations, in fact, are generally not needed because of the efficiency of the intelligence networks of the superpowers. Again it should be noted that from the point of view of effective deterrence, it makes no sense whatsoever to keep secret the military capabilities of the deterrer, provided that the capabilities are sufficient to deter. If the deterrer keeps secret the fact that it does have capabilities sufficient to deter the aggressors, the likelihood of attack would be increased. The aggressors would attempt to compute the relative advantage of attacking or not attacking, and would be laboring under a misconception with regard to the strength of the deterrer. Any computation would under-

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[11]See Singer, Deterrence, Arms Control and Disarmament, Chapter III, and Snyder, Deterrence and Defense: Toward a Theory of National Security, Chapter II for excellent discussion of these issues.

estimate the disutility of retaliation. The consequence would be a greater probability of an attack.

If deterrence fails the former deterrer must face the question of whether or not to carry out its threat to retaliate. The first strike would have been principally directed against counter-force targets. If the attacked state chooses to retaliate, it will face the possibility of retaliation by the original aggressor with a portion of its remaining nuclear force. This second round attack would be likely to be aimed at city targets and industrial facilities. A second strike could be more damaging to life and property than was the first strike. This being the case, the attacked state would have real and powerful incentives not to retaliate after the first strike. To establish the credibility of a state's intent to retaliate in such a situation presents a real problem, however,

The credibility that a given threat or promise will be carried out will depend upon the perception by the attacker of the utility which the fulfillment of the threat would bring to the deterrer. If the deterrer threatens to carry out an act which is clearly in its best interests, the credibility of the threat will be high. The problem with nuclear retaliation is that it is not clearly in the self interest of the deterrer to complete the threat. For the threat to be reasonably credible, the deterrer must create the impression that it will derive utility from retaliation even if the attacker then retaliates with a second round attack.

The credibility of retaliation can be established in three ways. A demonstration of widespread public support for a policy of retaliation

is one method. Such a demonstration would indicate that at least the uneducated public believed that enough benefit would be derived from retaliation to offset the possible damage of a second strike.

A state can also establish its credibility to retaliate by its record of fulfillment of promises and threats in the past. Where a state has carried out its past threats, particularly those which were of no direct benefit to the state, the believability of its threat to retaliate will be greater. It may be especially useful for the deterrer to have carried out threats to defend states which has little strategic, economic or political importance to the deterrer. Through the defense of such areas, the deterrer can demonstrate that it is willing to suffer for causes which are far from closely related to its prime interests. That being the case, any threat to retaliate in protection of its own territory is, ceteris paribus, more credible.[12]

A final technique which may be used to establish credibility is through binding the deterring state to a type of "automatic" retaliation in the event of an attack. A truly automatic response would be dangerous in the event of the accidental firing of several missiles. Nevertheless, the decision makers of the deterrer can convey the impression that the decision to respond has already been made and that it will be carried out without reconsideration. This would allow the decision makers to keep actual control over the launching of retaliation so that they

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[12]Snyder, Deterrence and Defense: Toward a Theory of National Security, Chapter II.

need not retaliate if the strike is accidental. The disadvantage with humans remaining in control of the launch is that it would always be possible for them not to launch the attack. This possibility reduces the credibility of the threat but appears to be a necessary precautionary measure.

Given the magnitude of the destructive capability of nuclear weapons and in the absence of a mechanical automatic response mechanism, the credibility of the threat to retaliate could never be perfect. But for an attacker to be deterred it is not necessary that the threat be perfectly credible. This principle is illustrated in Figure 2:6 (see above). Action E illustrates a situation where the credibility of retaliation and the resultant disutility is perceived to be low, 20%. Nevertheless, the magnitude of the possible destruction is so great that deterrence of the contemplated action is dictated. This is an action which is analogous to the problem of nuclear retaliation. The threat to retaliate may have low credibility, but the magnitude of the destruction which retaliation would cause is enough to deter attack even where the retaliatory threat is of low credibility.

This completes the development of a model of nuclear deterrence. Figures 3:2 and 3:3 summarize the process. In Figure 3:2, the potential attacker indicates that if it attacked the deterring state, and experienced no retaliation, that it would realize a utility of twenty units. If the defender retaliated however, the attacker would suffer disutility of a magnitude of one hundred units. If the defender does not retaliate to the attack, the attacker perceives that the defender will suffer fifty utility units of damage. If it does retaliate, the attacker will also

The Aggressor's Calculations

	Aggressor	
Deterrer	Attack	Not Attack
Retaliate .20	-100	0
No Retaliation .80	+20	0
Expected Value	-4	

Figure 3:2

The Utility Calculations of the Deterrer for Retaliation, as Perceived by the Aggressor

	Retaliate	No Retaliation
Attack	-100	-50

Figure 3:3

[13] Ibid.

respond causing a total of one hundred units of damage upon the defender. On this basis, the attacker estimates that the probability of retaliation is no more than twenty percent. Even though the credibility of retaliation is low, the potential attacker will be deterred because the probable expected value of attack is negative.

The power of inertia and the fear of total devastation should not be underestimated in the deterrence equation. Even if the example had indicated a slightly positive value for attack, most leaders would be loathe to act upon it. These numerical calculations are based upon numerous estimates any number of which could completely distort the calculations. Where the possible disutility of failure is something short of total devastation, many leaders might be willing to consider such computations. Where the possibility of complete destruction of the state as a functioning social unit exists, most decision makers would be conservative to a degree not suggested by this model.

Problems in Nuclear Deterrence

The preceding deterrence model oversimplifies the real world situation in one very critical respect. It presumes that the roles of attacker and deterrer have been clearly defined. This is not the case in the relationship between the United States and the Soviet Union. While there are those, particularly in the United States, who would continue to argue that the Soviet Union is clearly the potential attacker and the United States is the deterring state, that argument seems to have less and less validity. At present it is not easy for a disinterested third party to distinguish between the intentions of the United States

and the Soviet Union. The problem is complicated many times more when it is the decision makers of the Soviet Union and the United States who must attempt to clarify the intent of their rival. The simple fact is that it is possible to assert that Soviet planners could fear that the United States might at some time in the future, find it advantageous to attack the Soviet Union, just as American planners have long feared the possibility that the Soviet Union might attack the United States.

This situation presents a serious problem to the planners of both states. Because of the benefit which would result from striking the first nuclear blow, this ambiguity of roles creates an unstable condition. The greater the fear of one state that the other is planning to start a nuclear war, the greater the incentive for the first state to preempt the second. Because of this possibility, the decision makers of the first state must also develop a first strike ability of their own so that they can preempt the second, should a strike appear to be imminent. The second state will notice that the first has the potential to strike first and will question the intent of the first, will react to it through its development of capabilities and the action-reaction sequence will continue ad infinitum.

The ideal deterrent posture would tend to minimize the ambiguity with which its intentions might be viewed by the enemy. The defensive measures taken by the deterrer, the deterrer's choice of weapons and its targeting policy will contribute to the way in which the rival

state may interpret the intent of the other.[14]

Defense Preparations

In the event that deterrence fails, the decision makers of a state will logically seek methods and capabilities to lessen the damage caused by the attack. Unfortunately, the development of such a capability can be provocative when the roles are ambiguous. Any attempt to gain invulnerability from a first strike can, everything else held constant, be interpreted to mean an attempt to gain invulnerability from a retaliatory strike as well. A perfect defense system, without any addition to the offensive capability of the state, would give the state a "first strike capability." It would be able to attack without fear of suffering the consequences of retaliation.[15]

The anti-ballistic missile is such a defensive weapon. The issues specifically involving that system will be discussed in the next chapter. Civil defense measures also have a bearing on the defense capability of a state. A large scale bomb shelter program which could protect large segments of the population would be highly provocative because it would require longer than thirty minutes warning time to be effective. More time will be required because shelter would

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[14]An attacker may aim its attack at either its enemy's arms capabilities or at the cities of the enemy, or at some combination of the two. The first is "counter-force" targeting, and the second is "counter-city."

[15]First strike capability: That capability which would allow a state to strike first and destroy a sufficient portion of the enemy's retaliatory capability so that the first state would not suffer "unacceptable" damage as a result of a retaliatory strike.

have to be built away from cities that are likely targets. No shelters could withstand the concentrated attack which would fall upon the cities, and it would take far longer than thirty minutes to move any substantial amount of people.

Fallout shelters are not so provocative. Built into homes and apartment houses, they can be of great use even within only thirty minutes warning time. Since they would not be designed to withstand attack, but only to provide protection from radiation, they would protect a population only in the event of a counter-force attack. They would not take away the rival's power to damage the population seriously through a retaliatory strike.

Weapons Systems

Weapons which are extremely vulnerable to a first strike are among the most provocative. Since they are vulnerable they are of little use in anything but a first strike. Retaliation cannot take place with weapons which have previously been destroyed. Missiles which have not been placed in hardened bases, and which require longer than one half hour to launch are particularly provocative.

The Polaris-Poseidon submarine based missiles are less provocative because of their invulnerability. It is true that they can be used in a first strike, but that is not their only use. The Minutemen ICBM's which have been placed in hardened silos to increase their invulnerability to a first strike are likewise not as provocative an unprotected missiles. Anything which can increase the invulnerability of a state's strategic forces decrease the net utility of striking first. Anything which does

that will increase the likelihood of deterrence.

Targeting

The targeting of strategic weapons has led to a great deal of controversy.[16] There are two alternative forms of targeting policy: counter-force and counter-city. Counter-force policy is one which directs the bulk of the attack against the strategic capability of the enemy. Counter-city directs the attack against the population and industrial centers of the enemy.

Counter-force policy is advocated by those who fear that our adversaries would not be deterred through the loss of population and industrial capacity. They believe that only by threatening the enemy's strategic capability will the enemy be deterred. There are two disadvantages to a counter-force policy: 1. It places no limit on the size of the capability needed to insure deterrence. As the enemy increases it strategic forces, the deterrer must keep pace. 2. It is provocative. It does no good to target missiles against strategic capabilities which have already been launched. Since the latter is absurd, the second state in the rivalry would have good reason to believe that the first was planning to strike first.

A counter-city targeting policy has much to commend it. It is non-provocative because it would not be useful in a first strike. Secondly, it is finite in the weapons required to carry it out. It does not matter what quantity of deliverable warheads the other state

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[16]See Snyder, Deterrence and Defense: Toward a Theory of National Security, Chapter III.

develops, if the first has enough capability to inflict unacceptable damage upon the population of the second, it should have enough to deter attack. This will be a stable quantity of warheads for any given levels of effectiveness of enemy active and passive defenses around its cities.

Robert McNamara has best summed up the apparently very complex state of deterrence between the United States and the Soviet Union very simply. "As long as neither the Soviet Union nor the United States has a first strike capability against the other country, an unprovoked nuclear attack is possible only through error or insanity."[17]

It is theoretically possible that this mutual balance of terror could be upset if either one of the super powers developed a radically new weapon which could give it a first strike capability. The question to be addressed in the following chapter is the possible effect of an anti-ballistic missile system on this balance.

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[17]McNamara, The Essence of Security, Chapter IV.

CHAPTER IV

THE ANTI-BALLISTIC MISSILE

As was noted in the previous chapter, there are problems presented by the development of defensive weapons which are peculiar to the nuclear age. A weapon which is ostensibly defensive in nature can be of equal or greater value as a tool to insure a successful offensive strike. This fact would be of no problem if it were not for the uncertain nature of the intent of both the United States and the Soviet Union with respect to each other. If one were unambiguously intending to launch a first strike at some time in the future, then the second state would be well advised to make any defensive preparations which were possible to mitigate the effects of that strike. Such preparation would be obligatory. Any and all defensive and deterrent measures which would negate any possible value of attack would be acceptable as means of avoiding attack, and they would be completely justifiable on that basis.

Unfortunately for decision makers, the issue of war and peace has never been so clear cut, nor are the relations between the United States and the Soviet Union so clear cut today. The history of the relations between the two super powers is filled with rhetoric which has contributed to this confusion. The leaders of both states have, at various times, proclaimed nothing but the most peaceful of intentions, while accusing the other state of secret aggressive designs. On other

occasions leaders have been unmistakably aggressive. Premier Khruschev's announcement that the Soviet Union would "bury" the United States is matched by presidential candidate Barry Goldwater's suggestion that the United States "lob an H-bomb into the men's room of the Kremlin."

The rhetorical confusion has been equalled by the ambiguity of intent projected by the actions of both states. The United States built an imposing strategic superiority in ballistic missiles out of a non-existent missile "gap." Today the Soviet Union is engaged in an even more massive program of deployment of strategic weapons. Did either of these developments indicate that the respective state was attempting to develop a first strike capability? During the time that the American Minuteman missile was being deployed, the answer could not have been apparent to the Soviet Union. Today, it is clear that the United States did not so intend because the program was stopped before such a capability was gained. But at the time, the leadership of the Soviet Union would have had good reason to wonder about the purpose of the action. At present, the leadership of the United States has similarly good reason to wonder about the Soviet Union's intent. The SS-9 missiles which the Soviet Union is deploying are of such a large size and great accuracy that many have suggested that it is a first strike weapon. Certainly the missile would be of value in a first strike. This value would be far increased if the weapons were fitted with

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[1]See The Economist, October 30, 1971, pp. 16-18 for a discussion of the recent strategic arms deployments of the Soviets.

MIRV devices.[2] Nevertheless, the missile is not of value solely as a first strike system. It may be that its sole purpose is deterrent in nature. The fact that the missiles are being placed in heavily reenforced concrete silos indicates that the possibility of having to launch the missiles after a strike by the United States has not been overlooked.[3] The program may simply be the result of Soviet decisions in the middle 1960's to regain some kind of parity with the United States in ballistic missiles.

One cannot be sure of the intentions of the Soviet Union any more than a Soviet planner can be certain of American intentions. Until the time when the Soviet Union demonstrates its intentions without a shade of uncertainty, the United States must develop new weapons with the greatest of care. As long as the possibility of attack exists, the deterrent force must be kept in readiness at a strength which will deter Soviet attack. At the same time, if the Soviets are actually only attempting to deter an American attack, it would be a tragedy of monumental proportions to develop weapons which would lend credence to that fear. If the United States develops weapons of that nature, it can only force the Soviet Union to respond. The response may very well appear to the uncertain American planner as another attempt by the

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[2]MIRV is an acronym standing for multiple independently retargeted vehicle. Such a device allows a missile to be equipped with many warheads, each of which may be aimed at a target independently of the other warheads. As a result, one missile can strike at many different targets.

[3]Of course, if the Soviets are developing a first strike capability they might want to place the missiles in silos to protect them from an American retaliatory strike, or simply to add to American confusion. These possibilities emphasize the point that there is no certainty as to what the Soviet intent is.

Soviets to gain a first strike capability, thus justifying the development of more American weapons and the next Soviet response, ad infinitum.[4] To some extent, the weapons which the United States must have for an effective deterrent will reenforce any Soviet fears about American intentions. This is unfortunate but unavoidable. The Minuteman missile which is the basis of the American deterrent can be used as a first strike weapon even if its sole purpose is deterrent. With other possible weapons, however, this lack of specificity of purpose is not present.

In one form, an anti-ballistic missile can be such a weapon. In another form, the ABM can project an intent that is at least as aggressive as it is defensive.

The decision to deploy an ABM has been tentatively made by the President and Congress of the United States. This decision may be subject to change, expansion or discontinuation in the future. It is the contention of this study that the present Safeguard plan is far preferable to any deployment which would protect large segments of the American population. Subject to the results of the negotiations on strategic arms limitations between the United States and the Soviet Union, it is important that this plan be continued. The Sentinel program presents a unique opportunity to realize two often conflicting goals:

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[4]See the following for discussions of the arms race: George Rathjens, "The Dynamics of the Arms Race," Scientific American, April 1969; Quan R. Young, "The Political Consequences of Active Defense," Bulletin of the Atomic Scientists, February 1968; David R. Ingles, "Conservative Judgments & Missile Madness," Bulletin of the Atomic Scientists, May 1968.

1. The protection of the American deterrent force so that it could survive any attack and respond with a devastating retaliatory strike, and 2. the possibility of stopping the arms race at some status quo level acceptable to both the United States and the Soviet Union.

An ABM system which protects population centers will not contribute to the safety of the United States and the world from nuclear war. At best, an ABM deployed for the purpose of population protection will provide an evanescent security which will disappear in the course of new arms developments by the Soviet Union which will be stimulated by the ABM system itself. This unfortunate result will occur regardless of whether the Soviet Union has a deterrent or a first strike intent. For these reasons, the Safeguard system should not be expanded into a population protection system.

These contentions will be examined and supported in the course of this chapter.

Technical Functions and the Components of an ABM System

Whether the system is deployed for the protection of population or for the protection of hardened ICBM sites, the American ABM consists of essentially the same components and performs the same functions. There are three basic elements in the complex: radars, computers and the missiles themselves.

Three different radars are coordinated to develop as quickly as possible after the launch of an enemy missile, the trajectory of that missile. Perimeter Acquisition Radar (PAR) is designed to detect incoming missiles very shortly after they are launched. Multifunctional

Array Radar (MAR) picks up the missile somewhere at mid-flight and distinguishes between the actual missile and any decoys or electronic aids which the enemy is using to confuse the radar. The last radar is the Missile Site Radar (MSR) which is the only radar actually located at the missile site. This radar continues the functions of the MAR in its capacity of guiding the ABM to an interception.

There are two missiles used in the system. The Spartan is a long-range missile which is employed to intercept the warheads at long range. Should any warheads get through the Spartan defense, the short range Sprint missile is equipped to make interceptions at relatively short distances from the target.

Uniting the radar with the missiles is a complex set of computers. On the basis of the radar information, the computers determine the trajectory of the warheads and then plot a point of interception. The Sprints and Spartans are then guided to that part of the sky where an interception will take place.

If the interception takes place in outer space, the warhead is destroyed either by the X-rays or the neutrons which the nuclear detonation emits. There is no "blast" from a nuclear explosion in outer space for lack of atmosphere. Where the interception takes place within the atmosphere, the blast will provide the destructive force.[5]

Although the components of an ABM which would protect population centers are the same as those which would be used for hard point defense, the importance of the various units differs significantly. There is also

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[5]Scientific American, February 1968, p. 50.

an important difference in the degree of effectiveness required by the systems in the two different deployments.

In order for an ABM system to adequately defend a population area, it must intercept every incoming nuclear warhead and it must make that interception at a distance far enough from the target so that the explosion from the actual interception will not be dangerous. This is a difficult assignment for a number of reasons.

One of the leading problems is that of decoys and other aids to help the warhead penetrate the defense. There are many simple devices which the attacker may use which cannot be readily distinguished from the warhead. Even a balloon which is released in outer space will follow a trajectory identical to that of an actual missile. Small quantities of metal chaff can also be used to set up a screen which will reflect radar waves behind which the missile may follow. In addition to these mechanical penetration aids the attacker may purposefully explode a portion of its nuclear devices prior to reaching target. The purpose for such an action would be to take advantage of the radar blackouts which follow a nuclear explosion. At high altitude, these blackouts can cover a large portion of the sky for a period of several minutes.[6]

At lower altitudes the problems presented by penetration aids are not so difficult to solve. Some, in fact, solve themselves. Immediately upon entering the atmosphere, any aids such as the balloons or the metal chaff would behave in a manner easily distinguishable from a warhead. The difficulties which arise from radar blackouts in the lower atmosphere are

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[6]Hans Bethe, "The ABM, China and the Arms Race," Bulletin of the Atomic Scientists, May 1969, p. 43.

not complex. The area of blackout is a comparatively small area which would not serve as an adequate screen for a missile force of any size.[7]

No population defense can count on the aid of the atmosphere in surmounting the penetration aids. The interception must be made at high altitudes or the explosion from the interception will damage the cities and areas which the ABM was supposed to protect. So, the interception must take place at high altitudes and the question of the penetration aids must be solved another way.

Not only must the question be solved, but it must be solved to perfection, as must all of the other problems associated with population defense. In 1969, the Soviet Union had enough strategic warheads to be able to direct twenty-two of them at each of the fifty largest American cities.[8] Today, that number has undoubtedly increased. If an ABM is to effectively protect a city, it must intercept every single one of the warheads aimed at the city. If it is only ninety percent effective, the result would be devastating.

The requirement of one hundred percent efficiency in combination with the formidable problems of discriminating and identifying the warheads has led many to conclude that population defense cannot be achieved through an ABM system.

The defense of hard site installations such as the Minuteman missile fleet is considerably more easy. In the first place, the ABM system need

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[7]Bethe, "Hard Point v City Defense," Bulletin of the Atomic Scientists, June 1969, pp. 25-26.

[8]Weisner, "The Case Against an Anti-Ballistic Missile," Look, November 28, 1967, pp. 25-27.

not be completely foolproof. If only twenty percent of the one thousand American ICBM's survived a first strike, they would still be able to deliver a totally unacceptable retaliatory blow.

In addition to the fact that quite a low level of effectiveness can provide sufficient protection for the missiles is the fact that interception can take place at low altitudes with no adverse consequences to the missiles being protected. Resultantly, the interception process is far less complicated.

The Strategic Issues

Nuclear deterrence is based upon the ability of the superpowers to inflict damage upon their adversary even after the latter has struck the first nuclear blow. Anything which mitigates the damage which one state can deal to the other also degrades the deterrent of the first. This outcome is unavoidable. It is an unfortunate fact of the nuclear age that defense of populations and mutual deterrence are incompatible, but a fact it is, nevertheless.[9]

Because of this fact, an ABM which defends large population areas is likely to be initially very dangerous and ultimately very wasteful.

Assume first, that the Soviet Union has established the goal of attaining a first strike capability against the United States. At the present time this goal has not been attained. This situation can be represented by Figure 4:1. Point A is the status quo position and

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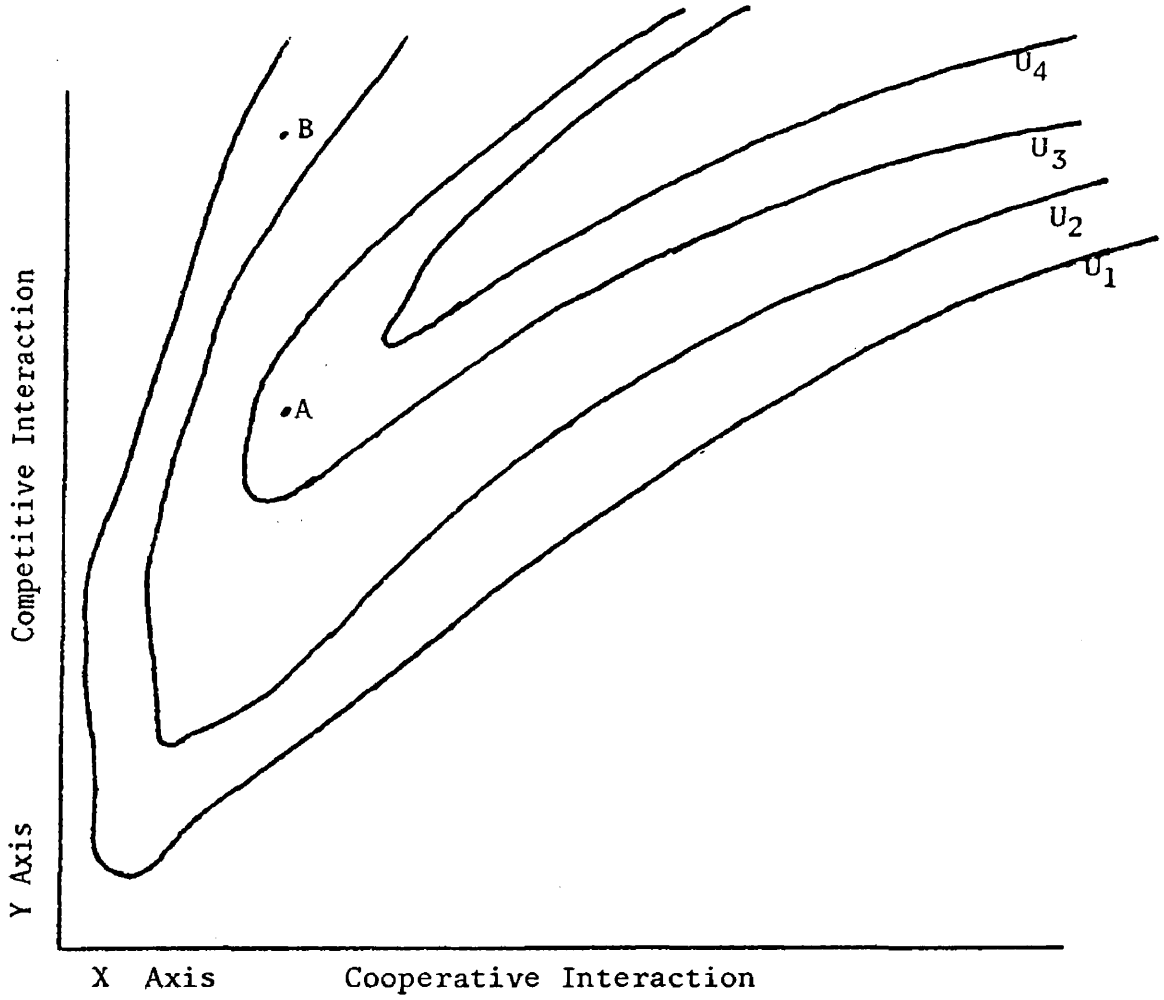
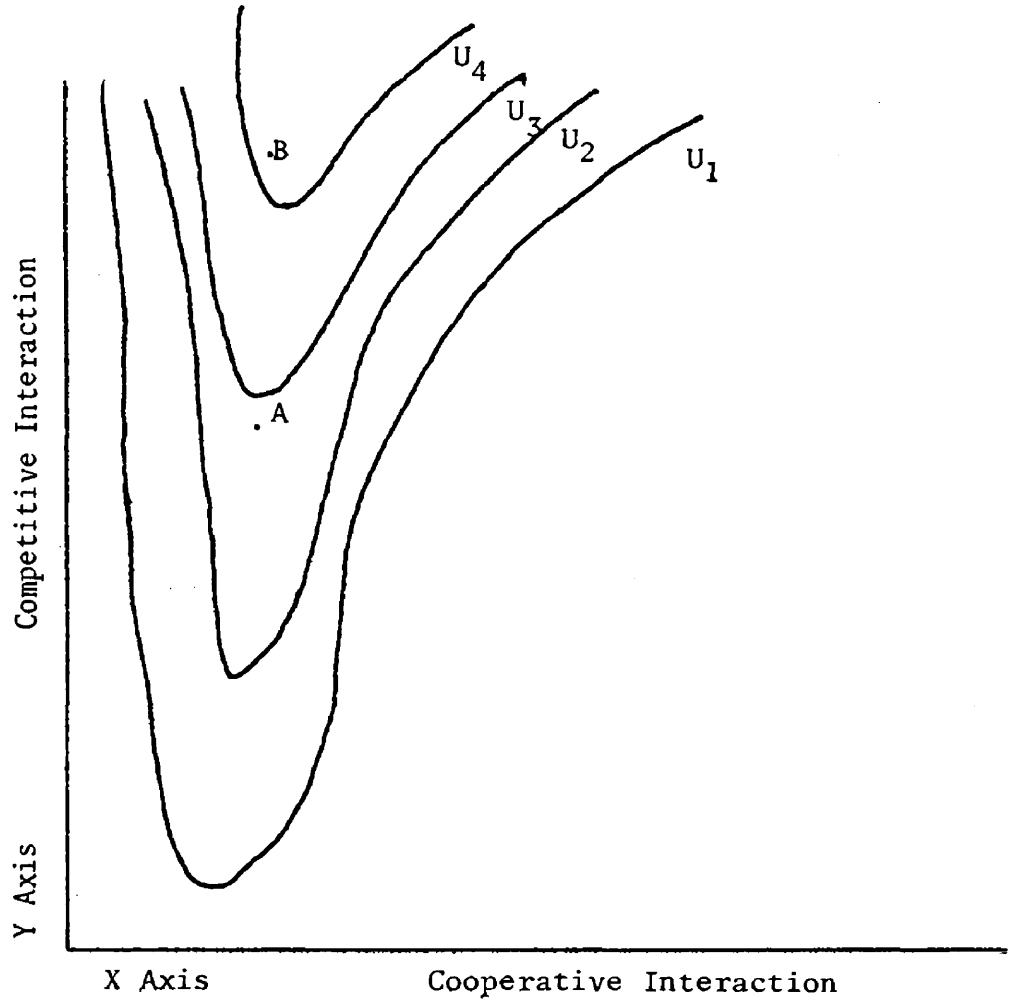
[9]Mutual deterrence is that situation in which the two potential adversaries are both deterred from war by a fear of the consequences of war.



Soviet Utility Map Showing
No First Strike Capability

Figure 4:1



Soviet Utility Map Showing
First Strike Capability

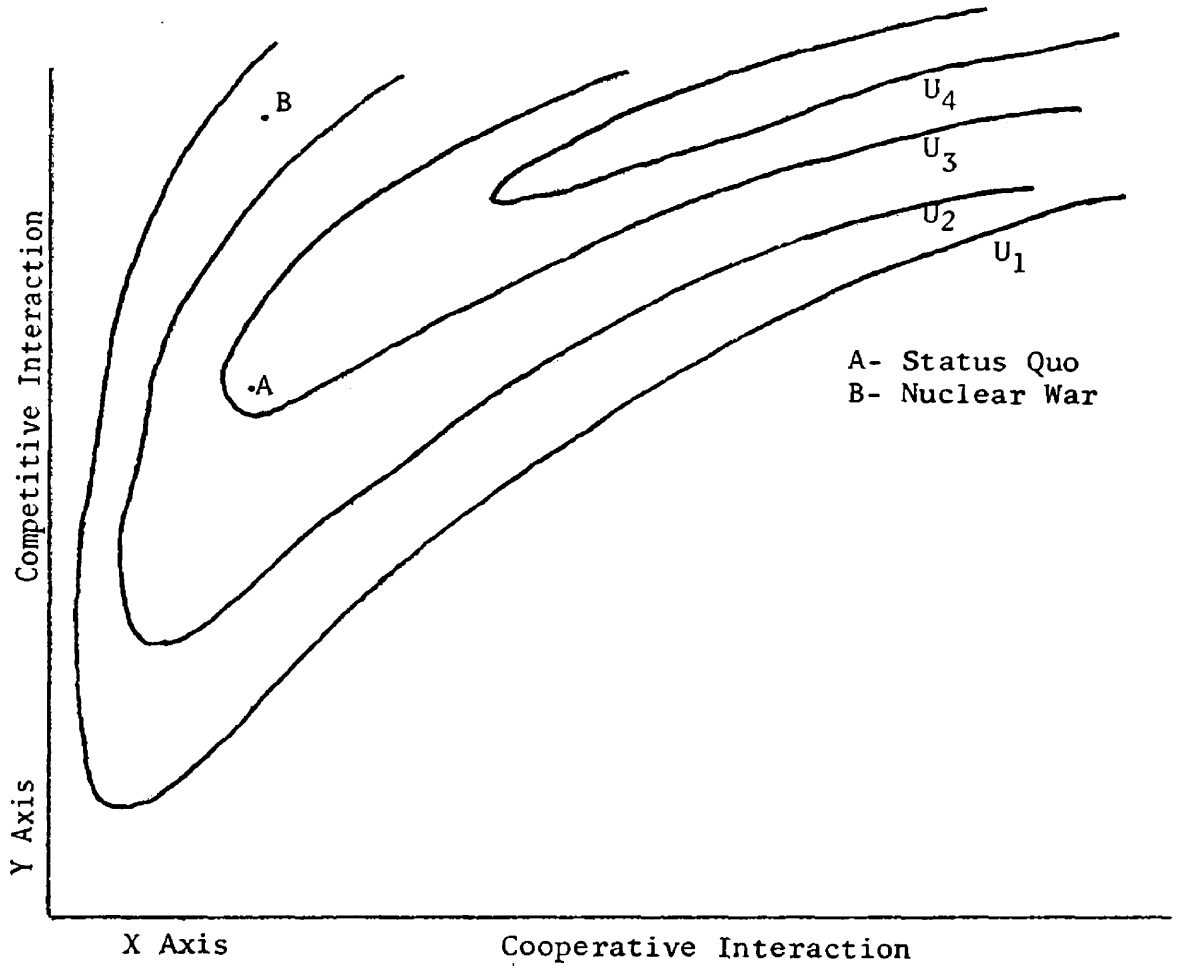
Figure 4:2

Point B is the position representing nuclear war. As long as the Soviet Union is without a first strike capability, Point B will be on a lower utility level than Point A. Such is the representation in the figure. The goal of the Soviets is represented by Figure 4:2. In this figure the same points of interaction are placed on a different utility map. This map shows that there would be positive value to nuclear war represented by Point B.

The United States must prevent the Soviet Union from attaining its goal. It must try to maintain the utility map for Soviet decision makers shown in Figure 4:1 and prevent a change in that map toward anything which would lead the Soviet leadership to conclude that a first strike would be beneficial.

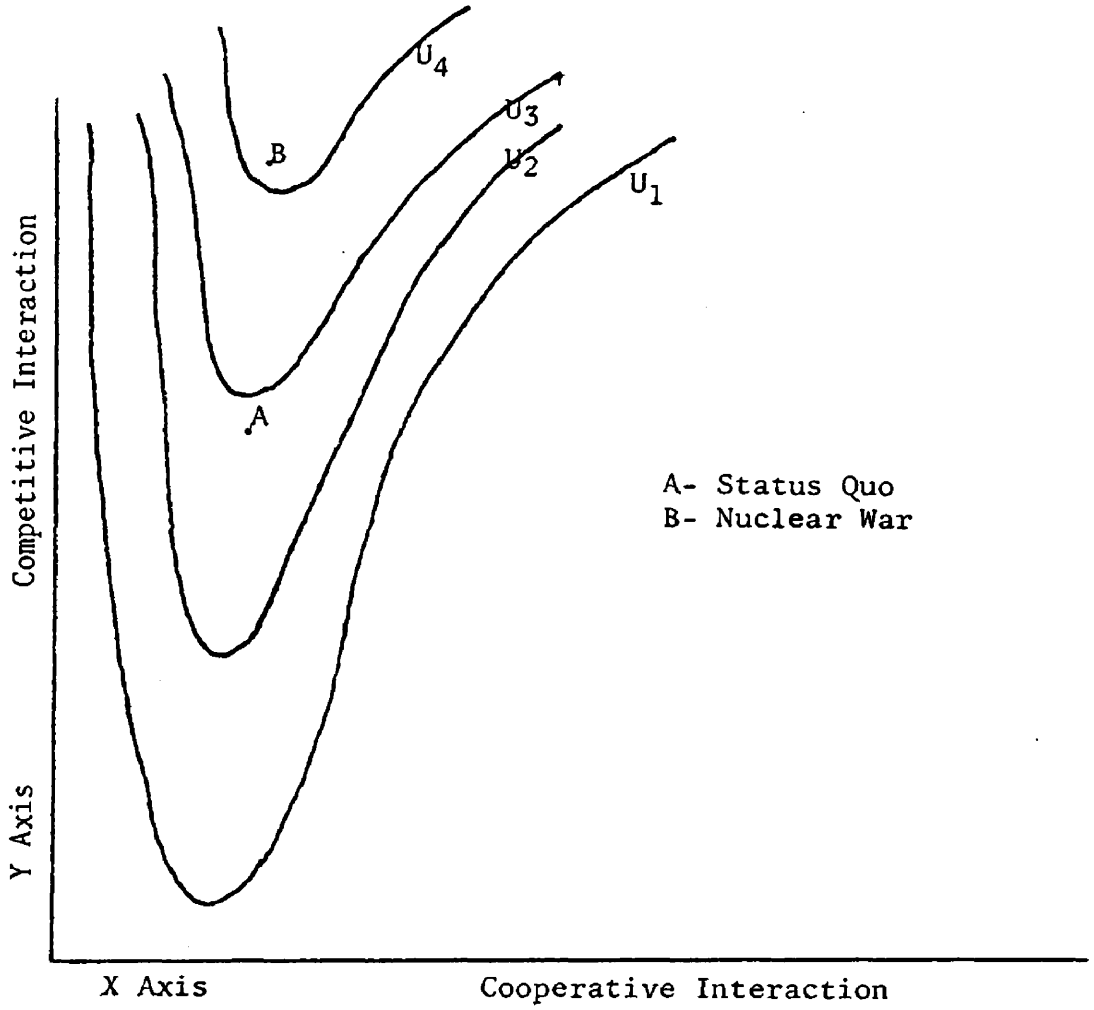
Both types of ABM defenses would contribute to the maintenance of the American deterrent against the Soviets. But a population defense would do more than needed. Only the retaliatory force need be protected in order to prevent the Soviets from developing a first strike capability. The defense of large population centers is superfluous to that requirement. Not only would an effective population defense prevent the Soviets from attaining a first strike capability, it would additionally give to the United States a first strike capability. The Sovietswould perceive that the American utility map had changed from Figure 4:3 to 4:4, marking the change from a negative value for nuclear war to a positive value. This would not help but be provocation to the Soviets. It would provide the substantiation for their worst fears of American intent.

As long as the assumption is made that the Soviets are attempting



American Utility Map Showing
No First Strik Capability

Figure 4:3



American Utility Map Showing
First Strike Capability

Figure 4:4

to gain a first strike capability, then they must respond to an American ABM whether it protects missiles alone or population, and as a consequence, missiles. The goal cannot be attained unless the Soviet Union more than offsets the effect of an ABM so that it can destroy a sufficient portion of the American missile fleet to prevent a damaging retaliation. The result must be an arms race for as long as the United States and the Soviet Union hold such conflicting goals. The effectiveness of any ABM will be limited by the speed with which the opposition can overtake the defense. At present, the difficulties raised by overcoming a defense are less complex and more cheaply solved than those which are presented to the defense.[10]

On the other hand, if the Soviet Union is not oriented toward the achievement of a first strike capability but only oriented toward the maintenance of its deterrent, an arms race would only be given stimulus by an ABM which protects American populations. A population defense would degrade the Soviet deterrent. The Soviet Union would be forced to respond to any population defense in order to secure its own deterrent force. A hard point ABM would not be provocative in this respect. The population would be left hostage to the good intentions of the United States. There would need be no Soviet response because it would not degrade their own deterrent.

Here lies the chief hope which may be realized through a hard point ABM. It can be used as a test of the Soviet intentions. If it

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[10]Robert S. McNamara, "Testimony Before the Joint Session of the Senate Armed Services Committee and the Senate Subcommittee on Department of Defense Appropriations," in Bulletin of the Atomic Scientists, June 1967, p. 24.

induces a response for the purpose of overcoming the system, then we may be forced to conclude that the Soviet Union does have a first strike intention against the United States.

There might be other reasons for a compensating response, but this would certainly appear to be the most likely.

If there is no response, however, it can indicate one and only one thing: that, for the time being at least, the Soviets do not have aggressive designs against the United States and its allies. Such a happy revelation might be the first step to the ending of the armaments race at the strategic balance acceptable to both sides.

These possibilities are summarized in the following table.

One of the principal arguments against an ABM system is that it would provide additional stimulus to the arms race between the United States and the Soviet Union. The above suggests that this will not be the case where the ABM is deployed for hard point defense and not for population defense. The argument is continued, however, by the contention that even if the ABM which is deployed protects only hard sites, that the Soviets would fear that such a system could quickly be expanded into a population defense. They would be forced to prepare for that possibility.

The differences between the population and the hard point defense systems effectively counters this argument. The technology which would be required for effective missile defense is only moderately more sophisticated than is presently available.[11] This technology which counts on

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[11]Hans Bethe, "Hard Point v City Defense," Bulletin of the Atomic Scientists, June 1969, p. 25.

U S ABM

Soviet Intent	Population Defense	Hard Point Defense
1st Strike Intent	USSR Must Respond	USSR Must Respond
Deterrent Intent	USSR Must Respond	USSR Need Not Respond

Figure 4:5

low level interception and destruction cannot be used for population defense for reasons noted above. There is no reason to believe that the deployment of an ABM hard point defense would give the United States a technological lead of any significance should it at some later date decide to deploy a population defense system.

The superiority of hard point defense is also apparent in a crisis situation. A crisis will magnify any doubts which the Soviets have about the United States striking first. The greater the doubts, the more likelihood that the Soviet Union would launch a pre-emptive attack. Because hard point defense ought not create such doubts, the possibility of a crisis developing into a nuclear war is not as great.

The conclusion is inescapable. An anti-ballistic missile which was deployed to protect major American population centers would provide a defense which must be overcome by the Soviet Union. The defense would be temporary at best, requiring modification as rapidly as the Soviets solved the problems which it raised for its strategic missiles. At worst, the system would be obsolete as it was being deployed and might always be behind Soviet offensive technology. In exchange for these dubious benefits, the system would sponsor and stimulate a new round of developments in the arms race which would, in the words of former Secretary McNamara, "increase greatly both their expenditure and ours without any gain in real security on either side."[12] The tension between the superpowers would very possibly grow as each

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[12]Robert S. McNamara, quoted in Donald S. Bussey, "Deployment of the Anti-Ballistic Missile: The Pros and Cons," The Library of Congress Reference Service, Washington, D.C., 1967, p. 14.

new round of arms development substantiated the doubts of one state about the intentions of the other.

The probable consequences of hard point defense stand in dramatic contrast to population defense. The American deterrent would be protected without having degraded the Soviet deterrent. If the Soviets have aggressive designs against the United States, this also may stimulate the arms race, and tensions would surely rise. But if the Soviets are as fearful of nuclear war as the United States professes to be, then they would not be forced to respond to the American ABM. The Soviet deterrent would be undisturbed and the American deterrent would be safe. This might provide an ideal, natural stopping point in the arms race, at a level of mutual deterrence acceptable to both states.

In light of the possible benefits which might result from a hard point ABM system in addition to the mere protection of the American deterrent, it is all the more important that all efforts to expand the scope of ballistic missile defense to cities be defeated.

CHAPTER V

CONCLUSION

This research project was undertaken for the purpose of making an evaluation of the anti-ballistic missile as an instrument of nuclear deterrence.

In order to make this evaluation, the first two chapters attempted to identify the elements of deterrence in general and nuclear deterrence in particular. Deterrence itself is not a new method of exerting influence upon others. It is an influence process which is found in the simplest interpersonal interaction as well as the interactions between complex socio-political units. The process depends upon three variables: 1. The ability of one unit to control the present or future utility of another; 2. The ability of the first unit to communicate the intent to exert that control and; 3. The degree to which the second state believes the communicated intent of the first. Deterrence of a specific act will take place when as a result of the communication by the first state, the second state perceives that the contemplated act will not increase its utility as compared to other alternative actions.

The second chapter illustrated these principles through the use of models originating in the discipline of economics and the game theory models first developed by Schelling.

A modification of these principles was presented in the probability-utility model of deterrence. This model relates the magnitude of the

possible loss or gain with the probability of the loss or gain actually taking place. It was thus shown that deterrence can be maintained through a threat which has low credibility provided that the threatened loss is sufficiently great. Likewise, a threat which has high credibility need not be so overwhelmingly destructive.

These principals are easy enough to understand. The application of them to the problem of nuclear deterrence between the United States and the Soviet Union is not so simple.

The difficulty is created primarily because of the uncertainty with which the Soviets and Americans view each other's intentions. On the one hand the United States certainly does not want to allow the Soviet Union to attain a first strike capability against it. On the other hand, if the Soviets are not motivated by aggressive design, it would be dangerous and expensive for the United States to give the Soviets any reason to suspect that American intentions were basically aggressive.

The Safeguard type ABM system which primarily defends strategic missiles offers an ideal solution to this dilemma. An anti-ballistic missile system which defends large population centers would be no solution.

A city defense ABM system would project an American intent which is at best ambiguous, at worst aggressive. It would, perhaps, offer some protection for American cities in the event that deterrence failed. But to the extent that it would offer such defense, it would degrade the deterrent of the Soviet Union for which there would have to be compensation. The result, regardless of Soviet intentions must be an additional round to the arms race and increased tensions between the two states.

The Nixon administration is to be commended for having rejected an ABM system which would defend cities and for deciding instead upon the Safeguard system. While the Safeguard would not protect the United States in the event of nuclear war, the decision to deploy the Safeguard ABM missiles has already made a contribution to the security of the world from nuclear war, even before any missile bases were completed. This contribution is the recent Strategic Arms Limitation agreement finalized by President Nixon in Moscow. Of course, in the social sciences, it is impossible to prove the contention that the Safeguard system and the decision not to deploy a city ABM defense system contributed to the agreement to limit strategic arms. Because the social scientist deals with human events and not physical phenomenon, it is impossible for the social scientist to run several different experiments, varying different elements and holding others constant, in order to locate the critical variables. He is reduced to making educated conjecture about the causes of certain events and the consequences for the future.

Given these limitations, one is nevertheless forced to conclude that Safeguard made the reaching of the arms agreement easier than it would have been had the United States been building a city ABM defense. Had it been built, the Safeguard would have communicated to the Soviet Union an unequivocally defensive intent because it would have affected the deterrent of the Soviet Union only in an insignificantly negative manner. In fact, this intent was communicated by decision to build the system in the first place. There was no interpretation which the leaders of the Soviet Union could have given to the system except that

it was defensive. How much easier it was for the Soviet decision makers to believe that the intent of the United States is defensive with respect to the Soviet Union, and how much that belief might have affected the ability of the Soviet leadership to overcome opposition within the Communist Party and agree to limit strategic arms, this researcher cannot say. But is there anyone who can contend that the agreement would not have been more difficult had the United States been in the process of building an ABM system which seriously degraded the Soviet deterrent and thereby made nuclear attack by the United States less costly? One must be particularly doubtful that the accord would have been signed in light of Mr. Nixon's decision to extend the war in Southeast Asia to North Vietnam with such force.

The strategic armaments agreement is in no sense an end to the danger of nuclear holocaust on this earth. The danger of nuclear war started by any of the lesser powers now acquiring nuclear weapons continues. And even between the United States and the Soviet Union, the accord is only a modest beginning. But it is a beginning full of hope and one which offers lessons for the future. Insofar as the anti-ballistic missile is concerned, we must note and learn and remind ourselves, our fellow citizens and our leaders that the strategies of the age of conventional armaments may be inappropriate and dangerous in the nuclear age. We must learn that the principles of a previous age offer only a false security in the present. And the decision makers of the major powers must learn to view the actions which they take through the eyes of the decision makers of other states.

This researcher is not suggesting that the utopia nuclear disarma-

ment is at hand. Perhaps it can never be reached. Nor is this researcher suggesting that the Soviet Union is without aggressive designs. The intent of the Soviet leaders remains filled with ambiguity. This researcher does suggest though, as this thesis has attempted to demonstrate, that tensions between the superpowers can be foolishly and pointlessly exacerbated by certain armaments decisions. On the other hand, tensions between the United States and the Soviet Union can be decreased through the unilateral actions of one state, which do not endanger the security of that state. The decision not to defend American cities with an anti-ballistic missile system but to defend a portion of the United States land missile force was such an action. The productivity of this careful conduct of strategic affairs is attested to by the recent events in Moscow.

Let the leaders of the United States and the Soviet Union keep the example of the anti-ballistic missile question in mind. Let them remember that the security of each state is fully as dependent upon how one state interprets and reacts to the actions of the other as are the actions by the first state alone. Let them recognize that alternatives to increased tensions do exist and can be found. Then perhaps an end to this nuclear madness can be reached.

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